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INDEX OF CONTENTS.

HORTICULTURE—MISCELLANEOUS	Nos. 138-144
TREE FRUITS, DECIDUOUS	145-165
Varieties, Selection	145-151
Root growth	152-154
Growth, Nutrition	155-158
Pollination	159-160
Manuring	161-163
Harvesting and after-care	164-165
SMALL FRUITS, VINES, NUTS	166-174
VEGETABLE GROWING	175-182
FLOWER GROWING	183
PLANT PROTECTION OF DECIDUOUS FRUITS	184-211
CITRUS	212-224
TROPICAL CROPS	225-260
STORAGE	261-264
PROCESSING	265-268
NOTES ON BOOKS AND REPORTS	269-274

Horticultural Abstracts

Vol. III

June, 1933

No. 2

HORTICULTURE—MISCELLANEOUS.

138. OGG, W. G. 631.4(072)
The Macaulay Institute of Soil Research.
Scottish J. Agr., 1932, 15 : 1-10.

An account of this recently established research institute and its aims. Work carried out at the institute under the supervision of the director qualifies for the degrees of Ph.D. and D.Sc., at Aberdeen University.

139. EDITOR. 633/4(072)(931)
Research work at New Zealand University Colleges.
New Zealand J. Sci. and Tech., 1933, 14 : 202-9.

A tabular list of all investigations in progress in New Zealand University Colleges. The only item which could be described as horticultural research is work on the improvement of *Phormium tenax* (New Zealand Flax) at Massey Agricultural College.

140. SEIFRIZ, W. 634.95 : 581.143.32
Twisted trees and the spiral habit.
Science, 1933, 77 : 50-1, bibl. 11.

The object of this paper is to suggest that the twisting of tree trunks is not an environmental effect, but is the expression of a widespread tendency which is protoplasmic in origin and is inherent in all living beings from the amoeba to man.

141. HEINICKE, A. J. AND HOFFMAN, M. B. 581.132
An apparatus for determining the absorption of carbon dioxide by leaves under natural conditions.
Science, 1933, 77 : 55-8, bibl. 4.

The apparatus is similar to that used by Kostytschew and others and Schandrel and consists of a light-weight, closely fitting leaf chamber of cellophane connected to a CO₂ absorption unit—a modification of the type used by Brown and Escombe and for which a high efficiency is claimed—via a drying tube for estimating transpiration. Suction is applied from an electric vacuum pump and a rate of flow of 100 litres of air per hour measured by a flowmeter is maintained.

Estimations of the CO_2 absorbed from an equal volume of "normal" air are obtained at a point close to the enclosed leaves, the air used being passed through a cellophane envelope. Advantages claimed are (1) the leaf chamber can be arranged to have a minimum of "dead air space"; (2) excessively high temperatures are avoided—though the temperature of the chamber when exposed to the direct sun is from 6 to 10 degrees C. higher than the surrounding air; (3) the error due to absorption of CO_2 during the operations of changing the flasks and titrating is negligible. The apparatus was used to study the efficiency of apple leaves on potted plants in a greenhouse and the authors support the statement that wide fluctuations in the activity of a given leaf from hour to hour and day to day occur under constant environmental conditions, but a relatively active leaf seems to hold its rank compared with others under many varying conditions.

E.R.L.

142. EDEN, T., AND YATES, F. 581.084.2: 519
On the validity of Fisher's z test when applied to an actual example of non-normal data.

J. Agr. Sci., 1933, 23: 6-17, bibl. 15.

Of recent years the method known as the "Analysis of Variance" has been widely applied to the results of field experiments. The measure of significance of the variance known as the " z " test, which is an integral part of this method, has been thus applied to all classes of biological data. "There has recently become evident an epidemic of doubt as to whether these tests are suitable for application to non-normally distributed material." The authors have therefore made a practical test with actual data complying with the usual conditions obtaining in agricultural experiments. The test was made on a skew distribution obtained from the observation of 256 height measurements on Yeoman wheat. The measurements were taken from a plot of wheat divided into 8 blocks using Clapham's Sampling method. This distribution was of a type often found in agricultural (and horticultural) data showing a ceiling effect tendency to give smaller errors at the higher end of the height range.

A thousand random samples of possible arrangements of a field experiment were taken from the data and the distribution of Fisher's z obtained. The method of sampling and analysing the data is described, and the distribution was found to agree satisfactorily with the theoretical distribution. The result thus indicates that this test may be safely applied to data of this type.

[This work has a real application to horticultural results. It has often been suspected that the distribution of such data is skew in character, though the small number of observations available have made it difficult of proof; this type of skewness, where the variation in the larger trees is less than that of the smaller trees, has been frequently observed in measurements on fruit trees. For example, trees growing under ideal conditions tend to be more even than those where conditions are poor, since, for instance, a proper system of manuring may mask many of the local causes of variability which tend to become of first importance if the trees are starved. Abstractor.]

T.N.H.

143. PEDERSEN, A. 581.084.2: 519
 Plantebestanden i rodfrugtmarkerne. (Plant population in roots.)

I. Springenes størrelse og fordeling. (Size and distribution of gaps.)

Den Kongelige Veterinær- og Landbohøjskole Aarsskrift 1931, pp. 61-96, bibl. 2.

II. Springenes indflydelse paa udbyttet af sukkerroe og barres runkelroe. (Influence of gaps on yield in sugar beet and mangold (Barres)). [Danish-English summaries.]

Ibidem, 1933, pp. 44-75, bibl. 10.

The first paper shows that where a certain percentage of gaps on root crops exist in a Danish experimental field the number of gaps having 1, 2 or 3 plants missing is distributed at random in the field. The second paper shows that taking into consideration the increase in yield of neighbouring roots where there are gaps, calculated by Lindhard and Jorgensen (Om Betydningen af Spring i Roemarkens Plantebestand og Udbyttet af Aphaengighed af Plantebestandens

Taelhed, *Tidsskrift for Planteavl* 34 Bd, p. 565), it is found possible to make a correction to the yield for total loss due to the presence of gaps. The method is worked out in detail with tables and diagrams, and the theoretical results compared with the actual figures from Danish State experiments on mangels and sugar beet. [Similar methods might well be developed for correcting the yield of other horticultural crops where gaps are frequent.—Abstractor.] T.N.H.

144. DU PLESSIS, I. P. J. 581.084.2(68)
Demonstration plots, 1933.
Farming in South Africa, 1933, 8: 116-21.

A list with map of all the agricultural demonstration plots now in operation in the Union. The majority are concerned with grasses, spineless cactus and fodder crops, but there are some devoted to rootstocks and such fruit growing problems as pruning, manuring and varietal trials.

TREE FRUITS, DECIDUOUS.

Varieties, Selection.

145. HAMPSON, C. C. 634.11(73)
Trends in the apple industry.
Washington State Coll. Agr. Exp. Sta. bull. 277, 1933, pp. 107.

During the ten years from 1920-30 there was in the United States a net decrease of 27 million bearing apple trees or 41 per cent. In 1930 there were less than one half as many young non-bearing apple trees in the U.S. as in 1910. Yield per tree has increased 80 per cent during the last twenty years. From 1926-30 17 per cent of the commercial apple crop of the U.S. was exported as fresh fruit, Great Britain alone taking 51 per cent. Winesap, Jonathan, Rome Beauty and Delicious are the varieties most grown. A large increase in Delicious is in prospect during the next few years.

146. FAES, H., AND AUBERT, PH. 634.23(494)
Enquête fruitière en Suisse romande. L'étude des cerises (1930-1932).
(Fruit survey in French Switzerland. Study of cherries.)
Extrait de l'annuaire agricole de la Suisse, 1932, pp. 367-425.

Since 1924 the federal station at Lausanne has been surveying in turn the different fruits which are of particular interest to Swiss fruit growers. An account of the first enquiry on cider fruits was published in the *Annuaire agricole* in 1924 and 1926; dessert apples were investigated and reported on in 1928, while 1930 saw the publication of a third enquiry on dessert pears again in the same journal. The present paper on cherries is the result of enquiries, answers to questionnaires and examination of material undertaken during the years 1930-32. The enquiry has demonstrated, and to a large extent cleared up, the tremendous confusion in nomenclature, which has hitherto been extremely prejudicial to the production of desirable cherries, whether for dessert, preserving or liqueur production. Details of local varieties were taken and an attempt made to disentangle those types which are the most interesting by reason of fruit quality, ability to bear transport and resistance to diseases. The essential aim has been to determine both for nurserymen and growers a certain number of first-rate cherry varieties, which ripen at different times and to make known where these are obtainable. The description of varieties given includes type of tree, branching, foliage, fruit shape, size, colour, juice, etc., time of ripening. Group A, that of the Bigarreux, includes 11 varieties. Group B contains the "cerisiers-guigniers" or Geans. These are differentiated from the Bigarreux by the

authors as having soft fruits. Nine varieties are described and in addition 5 so-called Basle cherries and the Margalle or wild cherry. Group C contains 6 acid cherry varieties. The authors conclude by suggesting cherries likely to succeed at different altitudes in Switzerland and recommending greater care in preparation for and actual marketing.

147. TUKEY, H. B.

634.23-1.52

Artificial culture of sweet cherry embryos.

J. Hered., 1933, 24: 7-12, bibl. 7.

Certain early fruiting sweet cherry varieties produce non-viable seed. Hence in breeding from these varieties it has been found necessary to use a late ripening female parent thereby reducing the possibility of producing early ripening kinds. This non-viability is due to abortion of the embryo and not to lack of pollination. The problem is, therefore, the culture of these embryos by artificial means before abortion has set in. The following method was successful with embryos removed from the seed of Early Purple Guigne, the seed of which is characteristically non-viable, and with Burbank, Coe and Governor Wood. The fruit of the Guigne variety ripens in 38 days from full bloom. Twenty-six days after full bloom embryos were removed, sterilized in calcium hypochlorite, and placed in Crone's nitrogen-free nutrient solution (formula given) to which glucose had been added. The solution was sufficiently stiffened with agar to support the seedlings without preventing root penetration. Placed in the light the embryos developed chlorophyll in the cotyledons in 5 days, and developed leaves from 6-10 mm. and roots 25 mm. long in 30-35 days. Failure resulted when the embryos were kept in the dark, when glucose was omitted from the solution and when many embryos instead of few were placed in each culture flask. Root development was best in embryos taken late in the season. Germination could also be obtained under similar conditions without removing the embryo from the seed which, however, had to be cut across at the chalazal end in order to expose the cotyledons to the light. This method, though less certain of success, is definitely quicker and may be advised where large numbers are available and a few losses are unimportant. The next successful step was to germinate the seeds—cut at the chalazal end as before—under a bell glass, in pots filled with quartz sand and watered with sterile, complete nutrient solution containing glucose. All seedlings were potted singly and maintained in a greenhouse after the first pair of true leaves were growing strongly. The practical value of this process to the breeding of early ripening varieties of fruit is discussed.

148. GRASOVSKY, A., AND WEITZ, J.

634.21(569)

Apricot growing in Palestine.

Palestine Dept. Agr., Agr. leaflets, Ser. IV, Horticulture, No. 27, 1930, pp. 24.

An account for growers of the best methods of growing apricots on commercial lines in Palestine. Under Palestine conditions the apricot can be grown on various soils if worked on suitable stocks. These are:—

Almond on which 67% of the trees are budded. It is suitable for rocky, gravelly and calcareous soils, unsuitable for heavy moist soils. It makes a fast growing tree giving a heavy yield of large fruits. The union between stock and scion is often weak and easily broken by wind or weight of fruit. It is susceptible to gummosis. The usual type is the hard shelled bitter almond. Some villages use the hard shelled sweet almond. This is probably a local wild type. It is of upright strong habit and resistant to drought and disease.

Myrobalan. A stock which has been in the country only 8 years (in 1930). About 2.6% of the apricots in Palestine are budded on it. It withstands moist and heavy soils albeit with a diminished crop compared with that yielded on it on well drained land. Stock-scion union seems fairly good at present, though with some local varieties it does not always produce a strong union. [Used as stocks for plum and peach, Myrobalans raised from seed have been shown always to contain a large number of individuals which are incompatible with these scions.—ED.] The budded trees bear in the fifth year as compared with trees on almond stocks which bear in their fourth. The fruits are large, evenly sized and juicy. The foreign varieties,

Blenheim, Royal and Tilton, make strong unions with Myrobalan. The length of life of the budded tree is as yet unknown.

Apricot. About 1.5% of apricots are budded on apricot stock. The stocks are raised from seed of the inferior local variety Klabi. The most suitable though not essential soil is a rich, well drained loam. Dry soils are unsuitable. The established trees are large and healthy, being early and heavy bearers of good quality fruit. The buds do not always take easily. *Swedah* is a local stock [believed to be a variation of *Prunus domestica*.—Ed.] specially used in orchards under irrigation or in semi-heavy soils. The trees are medium sized and long lived, regular bearers and high yielders. Unfortunately they sucker freely over a large area. Stock-scion union is not very strong.

Peach very occasionally is used, chiefly on shallow medium soils and on those with a fluctuating water-table. It develops quickly and fruits early. The trees are short lived.

St. Julien has been introduced from France. It suckers badly and gives slow development of the scion. It resents excess of soil moisture and is subject to gummosis and *Scolytis*. It is considered definitely unsuitable.

Kasaria [*Prunus cerasia* Bl.—Ed.], a local wild stock from the hill forests, is being used on heavy soils in unirrigated orchards. It induces earlier blossom than Myrobalan and is only slightly later than almond. The yields are better than from almond stocks and less good than from Myrobalan. It is subject to scab. This stock also suckers over a large area. Climate and particularly exposure has a considerable influence on the apricot. It requires protection especially from hot and cold winds. Winter pruning for the first 3 years is severe, the aim being to form a strong, open, regular framework. The strong growths are tipped during summer, which has the effect of forcing out side growths which develop fruit buds. Trees so pruned develop small branches with fruit spurs all over the tree rather than having the fruit concentrated at the tips of the twigs. The bulletin concludes with brief descriptions of the apricot varieties grown in Palestine.

149. GRASOVSKY, A., AND WEITZ, J.

634.37(569)

Fig growing in Palestine.

Palestine Dept. Agr., Agr. leaflets, Ser. IV, Horticulture, No. 28, 1930, pp. 36, bibl. 1.

The usual method of propagation and the quickest and easiest is by means of cuttings taken in January or February. The cutting should be stocky, smooth, short jointed and of well-matured one-year-old wood. Occasionally a heel of the two-year-old branch is left attached. The cut is made through or close to a node. The length of the cutting is governed by the soil, in a heavy moist soil 25 cm., in dry and sandy soils 35-40 cm., and in nursery beds one-eyed cuttings 15 cm. in length. Cuttings must be planted immediately or else must be stored under moist conditions. The cuttings are set in furrows which are subsequently filled in until the cutting is firmly buried in the soil with the exception of one eye. This eye is usually protected with a little loose earth. Budding and grafting is not usual, except for the working over of an inferior variety with a better one. The budding method is eye or ring budding. Bark grafting is also used in winter. The graft is not placed in position till the latex has drained out. Planting time for rooted plants is two weeks before the buds swell. A suitable planting distance is 8-10 ft. Upkeep consists of regular and shallow ploughing and hoeing. Abundant irrigation as practised in Jericho is considered to produce inferior fruit. Any irrigation necessary should be during the rainy season rather than in spring and summer. Pruning is seldom practised. It is believed locally that figs on the lower branches split and sour more readily than those higher up, hence these are selected to be cut away. If the tree has to be reshaped it is topped to a height of 150 cm. and four or five side branches radiating evenly are left to form the framework. Subsequent work consists in removing only inner or crossing branches. Manuring and caprification are seldom carried out. The ancient custom of oiling the eye of the fig to hasten ripening still persists. The life of the fig seldom extends beyond 50 years and old trees are poor bearers. The bulletin concludes with a list of 54 varieties and the principal localities in which they are grown, including a detailed description of some 40 varieties.

150. AMEND, B. R. 634.37(79)
The fig in the Pacific Northwest.
Better Fruit, 1933, 27 : 9 : 4.

It is claimed that by growing varieties of figs suitable to local conditions more profits can be made than from any other fruit. The tree's requirements are met by any good soil, retentive of moisture and containing lime, sulphur, potash and iron. A south or partly south aspect is desirable.

151. MYERS, C. E. 634.11 : 575.252
A "reverse" mutation in the apple.
J. Heredity, 1933, 24 : 48.

The writer notes the incidence of one branch in a particular apple tree, which otherwise bears highly coloured fruit, bearing only poorly coloured specimens. It may be remarked that in Shamel and Pomeroy's résumé of recorded bud mutations in the apple (*ibidem*, 1932, 23 : 173 and 213 and *H.A.*, 1932, 2 : 3 : 216) out of 146 cases noted 143 were from light to darker colour and only 3 from dark to lighter colour.

Root Growth.

152. ZIMMERMAN, P. W., AND OTHERS. 581.144.2 : 546.262.3
Initiation and stimulation of roots from exposure of plants to carbon monoxide gas.

Contrib. Boyce Thompson Inst., 1933, 5 : 1-17, bibl. 14.

Out of 80 species of plants tested 27 showed definite root effects from exposure to carbon monoxide gas. The names of the remaining species which were exposed, presumably without effect, are not given. The following 10 species were induced to grow roots from young stem tissue :—*Nicotiana tabacum* L. var. Burley (tobacco), *Lycopersicum esculentum* Mill. (tomato), *Tagetes* sp. (African and French marigold), *Galinsoga parviflora*, *Cosmos* sp. 2, *Amaranthus retroflexus*, *Impatiens balsamina* (balsam), *Hydrangea macrophylla* C. (hydrangea). Roots were definitely stimulated in the following cases :—*Lycopersicum esculentum*, *Tagetes* sp. both, *Cosmos* sp. both, *Solanum tuberosum* L. (potato), *Solanum pseudocapsicum* L. (Jerusalem cherry), *Chrysanthemum coronarium*, *Brassica heracea* L. var. *italica* Plenck (broccoli), *Helianthus debilis* Nutt. (sunflower), *Gossypium hirsutum* L. (cotton), *Ipomoea batatas* L. (sweet potato), *Bryophyllum pinnatum* Kurz., *Forsythia viridissima* Lindl., *Ribes nigrum* L. (black currant), *Salix babylonica* L. (weeping willow), *Celosia argentea* L. var. *plumosa* (cockscomb). Details of length of exposure and methods used are given.

153. OSKAMP, J., AND BATJER, L. P. 634.11-1.4 : 581.144.2
Soils in relation to fruit growing in New York. Part II. Size, production and rooting habit of apple trees on different soil types in the Hilton and Morton Areas, Monroe County.
Cornell Univ. Agr. Exp. Sta. bull. 550, 1932, pp. 44.

This paper presents some very interesting data on the effect of a number of different soil profiles on the root and branch development of the apple. In an orchard and soil survey of part of Monroe County the performance of Baldwin apple trees was studied in relation to different soil types. Data are given of girth, leaf size, yield and stand of trees in 68 orchards, divided into two age groups of 15 to 24 years and 45 to 64 years. Detailed studies were made of the soil profile and proportion of roots at different depths by means of excavations made in typical orchards. Standardized trenches 10 ft. long and 2 ft. wide were dug at a distance of 10 ft. from the trunk of the older trees and 7 ft. from the trunk of the younger trees, tangentially to the general root spread. The soil was removed in 8 inch layers, until the limit of the roots was reached. The roots from each layer were graded into 5 sizes and weighed. The rate of water percolation was measured on the different profile zones. A record was made of the fluctuations

of ground-water level in various soil types in May and June 1931. Charts and tables are given showing the root position and relation to the soil profile in about 30 trenches. Definite relationships were found between tree performance, rooting habit, and drainage conditions. The most satisfactory tree performance was found on soils usually medium to light in texture, with deep subsoils permitting rapid to moderately rapid downward movement of water. These soils showed a uniform brown to slightly mottled profile, without marked contrasts between horizons. Low yields and unsatisfactory orchards were found on soils showing a contrasting grey layer profile with pronounced mottling. These usually have slow-draining subsoils at 2 ft. or less from the surface. The depth of rooting of mature Baldwin trees was found to vary from $2\frac{1}{2}$ to $8\frac{1}{2}$ ft., depending on the soil characteristics. Sixty per cent or more of the root weight came from the surface 16 inches on all soils studied, but the roots in deeper layers appeared to be valuable, since practically all the deep rooted orchards were productive. Shallow rooting was found where the ground water was close to the surface during the spring, or where a gravelly till substratum was found. The worst orchard conditions were found where the ground water level was high. W.S.R.

154. ROGERS, W. S. 581.144.2 : 634.13 + 643.726 + 634.723.1
Root Studies III. Pear, gooseberry and black currant root systems under different soil fertility conditions, with some observations on rootstock and scion effect in pears.
J. Pom. Hort. Sci., 1933, 11 : 1-18, bibl. 3.

This paper, most excellently illustrated by photographs and diagrams, describes the continuation of the author's work on fruit tree roots. The complete root systems of 5 pear trees, 4 gooseberry bushes and 9 black currant bushes were excavated from an 8-year-old plantation on sandy soil at Wrotham Heath, Kent. The comparisons available were:—(1) pears, gooseberries and black currants, (a) manured with 50 loads farmyard manure in year of planting, and (b) unmanured; (2) pears on seedling roots and on Angers quince stocks; (3) two varieties of pear on the same rootstock. Tables are shown of the actual weights and growths obtained and details are given of the type of roots developed under different circumstances. The manurial treatment very greatly increased both the root and top growth in all cases. The root systems of the manured trees and bushes tended to be relatively more compact than those of the unmanured. The ratio of stem to root weight was increased by manuring in the case of pears and decreased in the case of gooseberries. Actively growing roots were found in all three cases in February 1930, while the tops were still dormant.

*Growth, Nutrition.**

155. HOPKINS, E. F., AND GOURLEY, J. H. 634.11 : 581.192
A study of the ash constituents of apple fruits during the growing season.
Ohio Agr. Exp. Sta. bull., 519, 1933, pp. 20, bibl. 7.

The fruit used in the experiments was obtained from the orchards of the Agricultural Experiment Station, Wooster. The experiments were grouped into fertilizer tests, varietal tests under the same fertilizers, comparisons of fruits from different orchards, and from individual trees of the same orchard. Tables of analysis are given. It was found that physiological breakdown of apples is not closely correlated with either the nitrogen content of the fruit or the mineral content in the ash. That is not to say that on different soils or on soils exhibiting any deficiency the results might not be different. In the orchards under examination breakdown appeared to be seasonal and varietal, for instance in years of light crop Rhode Island Greening, Stayman Winesap, Grimes Golden and Baldwin are likely to be affected, particularly if the trees have been heavily manured with nitrogen, or have undergone any treatment likely to induce the production of excessively large apples. Delayed storage and high temperature storage also are causes of increased physiological breakdown.

* See also 162, 163.

156. BARNARD, C., AND READ, F. M. 581.145.1/2 : 634.2

Studies of growth and fruit bud formation.*

III. A year's observations on Victorian plums.

IV. A year's observations on growth and fruit bud formation in the apricot and peach.

J. Dept. Agr. Victoria (Australia), 1933, 31 : 37-52, bibl. 15.

III. The plums studied were Grand Duke (*Prunus domestica*) and Satsuma (*P. salicina*) at Templestowe in the non-irrigated southern district south of Melbourne and Prune d'Agen (*P. domestica*) at Shepparton, an irrigated district north of Melbourne having a warmer, sunnier climate. The differentiation and development of the flower buds are described in detail. In all these varieties there appeared to be a fairly consistent relation between the time of differentiation of the fruit blossoms and the cessation of length growth in the tree. In the spur buds of Grand Duke and Satsuma initiation of blossom occurred the week following cessation of fruit growth. In the apple differentiation of spur buds appeared to be correlated with the maturity of spur leaves, but no such relationship is evident in the plum. In Prune d'Agen and Satsuma, although elongation of shoots ceased more than two months earlier in the former, blossom differentiation in the axillary buds on the current season's growth occurred in both sorts three or four weeks after the shoots had ceased to elongate. In Satsuma, in which variety both spur buds and axillary buds were studied, the axillary buds were nearly a month later than the spur buds.

IV. The apricots and peaches examined were Moorpark apricot and Anzac peach at Templestowe and Moorpark apricot and Pullar's Cling peach at Shepparton. Apricot : Blossom bud initiation in the axils of the leaves of strong shoots began at Templestowe (cool, non-irrigated district) ten days to a fortnight after the shoots had ceased growth ; at Shepparton (hot, inland, irrigation area) growth cessation and bud initiation coincided. The reason for this difference is ascribed to different habits of growth in the two districts. Blossom development was two or three weeks later at Templeton than at Shepparton, but the subsequent development of the buds was much more rapid. Peach : Blossom initiation occurred in both varieties studied just prior to the completion of shoot growth. Thus, it is pointed out that in pear, plum, prune, apricot and peach there is close correlation between the cessation of shoot growth and blossom initiation. There appears to be no correlation between the dates of fruit maturity and initiation in the peach (or in the apple) such as has been found by Johansson in Sweden (Studies in Fruit Bud Formation. *Contributions from the Swedish Permanent Committee on Orchard Research*, No. 19, 1930. Swedish, English summary). The Anzac peach crop ripens two months earlier than that of Pullar's Cling, yet the dates of initiation are the same.

157. COLBY, H. L. 634.22 : 581.13

Seasonal absorption of nutrient salts by the French prune grown in solution cultures.

Plant Physiology, 1933, 8 : 1-34, bibl. 57.

After a review of previous work on absorption by trees the writer describes his own experiments at Berkeley, California, on 1- and 2-year-old French prune trees worked on Myrobalan stocks and grown in water cultures in the greenhouse. His observations on the effects of different deficiencies lead him to conclusions, the gist of which is as follows :—Sulphate starvation appeared to have a far less depressing effect on nitrate absorption than starvation of any of the other elements tested, i.e. K, Na, Ca, Mg, P. Potassium, magnesium and phosphorus starvation all very seriously depressed nitrate absorption. Calcium starvation prevented root growth entirely, while in the absence of very small quantities of calcium nitrate absorption was correspondingly small. The total phosphate absorption for the season was far more depressed by magnesium starvation than by potassium or sulphur starvation. Calcium starvation apparently prevented

*For studies on Victorian apple and pear fruit bud formation by the same authors see *J. Dept. Agr., Victoria, 1932, 30 : 349-61 and 463-8 ; H.A., 1932, 2 : 4 : 327 and 328.*

absorption of any considerable quantity of any ion. The primary peak in the seasonal nitrate absorption curve of the complete solution trees, both 1- and 2-year-old, occurred near the end of June 1929 with a secondary peak in late October, followed by a rapid decline to winter dormancy. Results in 1930 differed little. The curve for potassium absorption closely followed that for nitrate absorption, lagging slightly behind in the earlier part of the season. A high correlation was found between temperature (probably light intensity also) and the rate of nitrate and potassium absorption.

158. MORRIS, V. H., AND GERDEL, R. W. 581.192 : 546.32

Rapid colorimetric determination of potassium in plant tissues.

Plant Physiology, 1933, 8 : 315-9, bibl. 4.

This is a description of Jacobs and Hoffman's method for determining potassium precipitated as potassium sodium cobaltinitrate in plant tissue. It is rapid and convenient. It compares very favourably with the chloroplatinate method with respect to precision. It saves both time and labour and results in a much greater final precision. [From authors' summary.]

The following also is noted :—

STARK, A. L. **Correlation of specific heat and percentage of water in apple wood.** *Plant Physiology*, 1933, 8 : 168-70, bibl. 4.

Pollination.

159. VARGA, F. 634.11 : 581.162.3
Adatok néhány almafajta pollenmeddőségének genetikai magyarázatához.
(Contributions to a genetic explanation of the pollen sterility of some apple varieties.)
Matematikai és Természettudományi Ertesito, Budapest, 1932, Vol. 48, Pars I., pp. 359-413.

Attempts are being made to explain the contradictory results of different investigators on a genetical basis. The writer's investigations relate to three varieties. The phenotype is analysed applying methods of variation statistics. Results are correlated with data of pollen tube counts and measurements. Conclusions are drawn as to factorial constitution. I. Pollen grains of Winter Gold Pearmain can be classified phenotypically as normals and abnormals. Both groups are divided further into two sub-classes each. The fourth sub-class contains those of abnormal shape, colour and cell content. These are sterile and are called (after Renner) "gonsterils". The rest of the pollen grains, both normal and subnormal but possibly fertile, are called "gonfertils". Characteristic data of the phenotype proved to be fairly consistent. The curve of variation is asymmetrical and the writer thinks there is justification for supposing that a curve with two peaks is really characteristic for the variety. Concerning the origin of phenotypically different groups of pollen grains, these are regarded as the result of lethal factors. As a medium for pollen germination tests 10-15% cane sugar solution was found better than cane sugar agar with or without yeast extract. "Gonfertils" were partly inactive. Since percentual distribution of groups of a different genotype ("gonsterils" 10.85%, genotypically inactives 52.29%, genotypically actives or "gonfertils" 36.86%, total 100.00%) corresponds fairly well to the numerical data that may be expected for gametes in cases where the genotype of a parental individual carries at least four recessive lethal factors, the fact that Gold Pearmain is found to show different degrees of fertility in different localities (experimental data of Pas-secker, Kobel, etc.) is explained on the basis that the variety is a tetrahybrid. Winter Gold Pearmain is classified by the author as an unreliable, bad pollen producer. II. Pollen of variety Török Bálint (Roter Stettiner) with similar phenotypical groups. The curve of variation is either asymmetrical or with two peaks. A curve with two peaks is characteristic for the genotype. It is very probable that this variety also is a tetrahybrid with four recessive lethal

factors. These are more or less compensated by dominant non-lethal ones according to the age of the grains. Sufficient fertility can be expected only with pollen from young, just opened anthers. Török Bálint is a pollen producer of medium value, its value being enhanced by the fact that pollen is produced in comparatively large quantities. III. The Hungarian variety Batul (Batullenapfel) shows phenotypically as well as genotypically the same characteristics as Török Bálint, except that compensation of non-lethal dominant factors is still greater, inasmuch as their influence lasts longer. Consequently this variety is regarded as a reliable, good pollen producer, in spite of the fact that it also contains four recessive lethal factors. B.H.

160. RUDLOFF, C. F., AND SCHANDERL, H. 634.22 : 581.162.3
Befruchtungsbiologische Studien an Zwetschen, Pflaumen, Mirabellen u.
Reineclauden. I. (**Fertilization studies on different varieties of plum. I.**)
Gartenbauwissenschaft, 1933, 7 : 421-57, bibl. 29.

The authors give tabulated results of crossing and selfing some 33 varieties of plum and as regards self-sterility and fertility compare results in the U.S.A., England, Sweden, Denmark, U.S.S.R., with those obtained in Germany, where such are available. They summarize as follows:—

Self and cross pollination experiments were carried out in the years 1930-32 at Geisenheim on 47,076 plum flowers. 1. Of the 33 varieties tested 10 were found to be self-sterile, 4 nearly always self-sterile, 7 more frequently self-fertile and 10 self-fertile. Grosse grüne Reineclaude (=Greengage E.A.B.) and Mirabelle von Metz (=Drap d'or E.A.B.) proved self-fertile one year and self-sterile the following year. 2. Instances of both reciprocal and one-sided intersterility were noted. 3. It must be reckoned that as regards cross sterility some plum varieties are stable and others unstable in this respect. This feature needs careful attention in future work. 4. The sex organs, especially the female organs, appear to possess different degrees of bad weather resistance, in particular plum varieties. 5. Experiments on transport of pollen in cherries and plums show clearly that the pollen can be wind-borne over short stretches. This means that transport in this way from tree to tree is undoubtedly possible, while fruit setting may be expected in the absence of insect vectors in self-fruifl sorts when there is only a slight air movement at pollination time. 6. In view of the manifold "affinities" and apparent instability of such "affinities" in plums, it is essential that investigations on the biological factors of fertilization should be carried out over a period of many years and in as many places as possible on identical material, before any definite rulings can be made on the point.

Manuring.

161. KELLEY, W. P. 631.84
A review of researches on nitrogen fertilization in relation to economic crop production with special reference to future investigations.
J. Amer. Soc. Agronomy, 1933, 25 : 51-64, bibl. 22, being *Paper 270*, Univ.
Calif. Graduate School of Trop. Agr. and Citrus Exp. Sta., Riverside.

This review emphasizes the fact that nitrogenous manuring is a most complex problem and cannot be separated from those which concern other types of manuring, the composition, physical, chemical and biological of the soil and the effect both on the plant and primarily on the composition of the soil of the different types of fertilizer or manure used. It is found, for instance, that in any experimental work with nitrogenous fertilizers it is most important to provide adequate supplies of available phosphate and potash. If the soil is deficient in these or other nutrients or if its pH is unfavourable, nitrogenous fertilizers may not produce their best effects. Again calcium cyanamide has often caused damage to crops. The real cause of its toxicity still needs determination. In general the economic value of nitrogenous manuring is intimately connected with soil reaction, while the efficiency of the different nitrogenous materials is affected

by soil acidity and liming to very different degrees. The effect of a fertilizer on yield of any crop may either be direct or indirect through transformations produced by it in the soil. In considering nitrogen gains and losses in soils it is found that microbial processes involved in the decomposition of plant materials, the formation and decomposition of soluble nitrogen compounds and the fixation of atmospheric nitrogen are influenced by the C/N ratio of the organic materials of the soil. These processes need further investigation. As regards fruit growing, the author makes the following observations. American work has shown the necessity for nitrogenous manuring of citrus in California and Florida and for apples in Pennsylvania. Wallace's nutritional work at Long Ashton shows how the nutrient conditions of the apple tree markedly influence keeping quality of the fruit and the flavour of cider. The work of Gildehaus and Wallace suggests the possibility of the interaction of potassium and nitrogen in the growth and development of the apple tree as affected by carbohydrate synthesis and translocation.

162. STUART, N. W. 634.11-1.842.3 : 581.192
Nitrogen and carbohydrate metabolism of young apple trees as affected by excessive applications of sodium nitrate.
New Hampshire Agr. Exp. Sta. tech. bull. 50, 1932, pp. 26, bibl. 27.

The investigation was carried out on 100 2-year-old Baldwin apple trees planted on the University Horticultural Farm, Durham, New Hampshire. The soil varied from heavy loam to light sandy. The trees were planted in pairs as similar as possible, pruned to three or four shoots and mulched. On May 26th when in full growth one tree from each pair was given 1½ lbs. of Arcadian nitrate of soda applied in a circle 2-12 inches from the trunk. On June 18th slight burning of the foliage was observed on trees on the light sandy soil. Between then and July 28th leaf samples were taken on five occasions. It was found that the leaves from the heavily nitrated trees exhibited a higher plane of nitrogen metabolism and lower concentrations of carbohydrates than the controls. C/N ratios were consistently narrower in leaves from nitrated trees. Qualitative differences in the nitrogen metabolism of the leaves between nitrated and control trees are associated with the nitrate nitrogen fraction. Quantitative differences are most pronounced in the lipid and residual nitrogen fractions. Excessive application of nitrogen increases trunk diameter but, associated with foliage injury, seems to dwarf terminal growth. It is agreed that the data offer no conclusive evidence as to the toxic agent causing foliage injury. The methods of chemical analysis are described in detail.

163. DE LONG, W. A. 634.11-1.8 : 581.192
Some observations on the variability of the amount and composition of the ash of the Wagener apple under Nova Scotian conditions.
Scientific Agr., 1933, 13 : 505-11, bibl. 13.

The fruits were obtained from the manurial experiment plots at the Dominion Experimental Farm, Kentville. These plots have been subject to controlled fertilizer application since 1912. The soil is sandy loam with sandy to gravelly subsoil. No significant difference was found in the keeping quality of the apples in cool storage which could be attributed to the various fertilizers used, although the differences in the mineral composition of the fruit were found to be considerable. Thirty apples each from plots fertilized respectively with nitrate of soda, muriate of potash, acid phosphate, basic slag, limestone, and from unfertilized plots were tested in the present investigation which lasted three years. Compared with unfertilized plots, plots on which nitrate of soda alone had been applied without break were found to show a decidedly low total ash content. The potassium and phosphorus ash constituents were also much below those found in fruits from unfertilized plots. Similar effects as regards total ash and potassium content followed the use of limestone only. Muriate of potash used alone increased the total ash and potassium content of the fruit. The effects of acid phosphate and basic slag were not very evident. Seasonal variations in amount of ash were large and seemed to be connected mainly with the size of the crop, though rainfall may also have been involved. The method of analysis is described.

Harvesting—After-care.

164. DORSEY, M. J., AND POTTER, J. S. 634.25-1.562
A study of the structure of the skin and pubescence of the peach in relation to brushing.

Univ. Illinois Agr. Exp. Sta. bull. **385**, 1932, pp. 17, bibl. 6.

The dulling effect of both excessive pubescence and spray residue upon the appearance of the peach fruit runs counter to the demand in the trade for a cleaner, more attractive pack. Hence there has been a revival of interest in brushing machines. The bulletin studies the effect of brushing upon the shipping or keeping qualities of the fruit. The changes which take place in the epidermis and cell layers of the fruit from bud to maturity are described. In brushing or handling the peach hairs are always broken off at the surface of the fruit. The factors contributing to the structural weakness of the hair at this point are discussed in detail. Brushing mainly removes the longer hairs, the short hairs being seldom broken off. Although experimental data point to brushed peaches being somewhat more susceptible to brown rot infection than unbrushed peaches, growers find that the gain from the enhanced appearance of the pack is greater than the loss from rotting.

165. PALMER, R. C. 634.13-1.547.6
Conference pear harvesting experiment.

East Malling Res. Sta. Ann. Rept. for 1932, 1933, A.16, pp. 51-4.

PALMER, R. C. 634.11-1.547.6

Apple harvesting investigation.

Ibidem, pp. 55-7.

Both of these investigations were of a preliminary nature. The aim of the first was to get information on the influence of maturity at harvest time on quality and storage. Results achieved in one year suggest the lines which should be followed in the future work necessary for the attainment of definite information on the subject. In the second investigation the object was to examine the influence of rootstock on the maturity of Lane's Prince Albert apple. The results possible on one season's crop seem to indicate that amount of crop, size of fruit, colour development and russeting must all be considered when applying maturity tests to apples from trees grown on different rootstocks.

The following also is noted :—

CHAPELOW, H. C. **Apple variety collection.** *East Malling Res. Sta. Ann. Rept. for 1932, 1933, A.16*, pp. 58-63.

SMALL FRUITS, VINES, NUTS.

166. BEAKBANE, A. B. 634.714/717
Cultivated blackberries, dewberries and hybrid berries—a progress report.

East Malling Res. Sta. Ann. Rept. for 1932, 1933, A.16, pp. 68-72, bibl. 2.

Work at Malling has shown that classification is essentially the first step to be taken before essaying any investigations on the *Rubi*. The material as known to commerce appears to be extremely mixed. Thus a plot of 160 plants, which were bought commercially by the research station as loganberries, was found on examination to contain plants two-thirds of which were indistinguishable from a variety known in England in 1910 as the Phenomenal Berry, while the remaining one-third were nearly all botanically distinct from one another. The word "Loganberry" as used commercially should therefore at present only be considered as a group name. Clonal races of some 15 varieties of *Rubus* are being raised. It has been found that tip-plants are not fitted to stand exposure and long journeys so well as yearling bedded plants.

167. CROWLEY, D. J.

634.73

Observations and experiments with blueberries in Western Washington.*Washington State Coll. Agr. Exp. Sta., bull. 276, 1933, pp. 20, bibl. 5.*

The bulletin describes the best methods of cultivation of the blueberry (horticultural varieties of *Vaccinium* spp.). The blueberry requires acid soil conditions and is best suited by sandy peat. In preparing new land for blueberry culture the practice of burning off the top growth should be avoided, since wood ash, even in small quantities, is toxic to blueberry. Cross pollination has been found to produce larger berries and higher yields than selfing, and the varieties recommended in this bulletin are all inter-fertile and flower simultaneously. Pruning is important since unpruned bushes soon decline in yield and size of fruit. The fruit is borne on mature wood of the previous season, the largest berries being on the most vigorous wood. The bush should be pruned so that it has several branches starting from the ground. This allows for the annual cutting back of one-third of the total number of branches to within 3 inches of the ground, the oldest branches being selected, so that at no time will the bush contain wood more than 3 years old. Though many local plantations produce good crops without the aid of fertilizers, the following fertilizer formula is recommended, since in the course of experiments the plots receiving it yielded twice that of the control plots in the first season followed by a still greater increase in subsequent years:—100 lbs. nitrate of soda, 200 lbs. rock phosphate, 50 lbs. sulphate of potash per acre. Propagation is usually from hardwood since this is usually available from prunings. The rooting medium is a well watered mixture of 2 parts peat to 1 of sand. The cuttings of 2-year or old wood, 6 inches long, are laid horizontally on the cutting bed, pressed down firmly and covered to a depth of 1 inch with finely chopped sphagnum moss or with the peat and sand mixture. The bed must be kept moist. In Washington the cuttings are laid down in January or February and have begun to shoot in five months. Normally, though not always, the old wood decays after the new shoots have rooted.

Cuttings of mature wood of the previous season bearing leaf buds only can also be rooted if set upright in the usual way in a tightly closed frame, in a saturated atmosphere. Under this system leaf growth starts almost immediately and root growth in about five months. Soft wood cuttings taken with a heel root well from May to July in sand on a 6 inch deep bed of chopped sphagnum.

168. NAVARRO, A. F.

587.83

Da diagnose das ampelideas hibridas do genero vitis. (Diagnosis of hybrid *Ampelidaceae* of the genus *Vitis*.) [English summary 11 lines.]*Lisbon, 1932, pp. 102, bibl. in text, being reprinted from Anais do Instituto Superior de Agronomia.*

This is a study of a method whereby, by morphological and anatomical analysis, the probable ancestors of vine hybrids can be determined. It was found that in the hybrids under observation in some of the organs, principally the leaves, the characters of one of the progenitors would show a tendency to predominate in one part of the vine, while those of other ancestors would predominate in other parts of the same vine. By a study of these characters it is claimed that it is possible to determine with a fair degree of accuracy some of the species that enter into the constitution of the hybrid. There is a comprehensive review of the literature on ampelography. The 70 illustrations, many being microphotographs, are clear.

169. WILLIAMS, J. L.

634.8-1.542

Vine pruning in non-irrigated districts.*S. Australia Dept. Agr. bull. 264, 1932, pp. 16.*

In this bulletin are given well illustrated accounts of the bush system and the Thomery espalier system of vine pruning and training. [The main points of the bush system are as follows:—The vines should be planted early, i.e. May or June (S. Australia). At the first winter pruning 2-3 spurs are left to provide the basis of main arms and these may be allowed more than 2 buds, as only the two terminal ones will burst into strong canes. At the second annual winter pruning

4-5 sub-divisions may be allowed, the spurs being as evenly spaced as possible and on the circumference of an imaginary circle of which the stem forms the centre. In the third season's development the vine will again be topped. The third winter pruning will consist of a choice of suitable spurs for continuing the direction of the secondary arms. These spurs should not carry more than 2 buds with a distinct internode between them. Thereafter the main essential is to create an equilibrium between root system and top growth. General pruning practices are noted and hints given as to their advisability under different conditions. The importance is stressed of cleanly removal of all surplus canes, i.e. close to the old wood, removing the base buds but yet not so close as to injure the bark of the older wood. The alternative, the Thomery espalier system, is in the author's opinion applicable to all varieties which can be successfully spur pruned, which includes all which can be bush trained. Its main disadvantage is the necessity for a 1 or even 2-wire trellis. Under this system a trellis wire is provided at 20-24 inches and the stem is divided into two main arms, one on either side of the stem, trained horizontally along the wires. The arms are supported by but not twisted round the wire. At the first pruning the vine is spurred back to a single growth, which in the second vegetative season gives a strong cane. This cane is topped in October or November to about $\frac{1}{2}$ inch above the wire. Two laterals are thus encouraged to develop and these form with the stem a T-shaped formation. At the second pruning these laterals form the basis of 2 main arms and are lightly twisted round the wire, being left of sufficient length to enable the pruner to take one or two twists around the wire before tying them down. Each primary rod is sectioned through the terminal "node". At the third pruning these primary canes are untwisted from the wire and extended, by training the cane developed from the terminal bud, a further distance along the wire. Alternating canes on the primary "rods" are spurred back to 2 buds in length, the first rod being at least 6 inches from the fork of the vine and the rest 6-8 inches apart. Subsequent pruning consists in extending and clothing the main arms. The author also notes three systems of rod pruning, giving considerable detail on the Bordelais espalier method.

Nuts.

170. ANON. 634.5
Nutgrowers discuss problems.
Better Fruit, 1933, 27 : 7 : 6.

In a very condensed account of the proceedings of the 18th Annual Convention of the Western Nut Growers Association held in December 1932 at Salem, U.S.A., the following points were mentioned as having been under discussion.

Pollination. Professor Schuster stated that certain chestnut varieties, which he named, had no pollen at all. He showed for the first time that certain round hazel nut varieties could be used to pollinate the Barcelona. Hitherto growers have had to plant long type nuts for pollination. Mr. C. W. Nobel has found the Franquette walnut pollenized with Meylan to give a yield of 45% over self-pollenized trees. Mr. P. W. Miller, the federal expert, claimed to have reduced walnut blight to less than 5% by two sprays properly timed in Franquette orchards. Seedling orchards in which the trees bloom at different times are more difficult but satisfactory control can be obtained. Mr. C. Trunk said that 25 year-old trees grafted on Californian black walnut are showing signs of lack of compatibility. They break through the outer and inner bark at the graft junction and then die.

171. HAMOND, J. B. 634.51(42)
A survey of the walnut position in England, 1932.
East Malling Res. Sta. Ann. Rept. for 1932, 1933, A.16, pp. 73-8.

Among points of special interest to English growers the following in particular would seem to be of interest to all growers. In an attempt to achieve uniformity of excellence, vegetative methods of reproduction are being tested both with scions and rootstocks. The scarcity of material has

necessitated most of the planting being done on seedlings of *Juglans nigra*. Some vegetatively raised stocks are now, however, being used on an experimental scale at Malling. Walnuts do not root freely from cuttings or layers. It is found that hybrids of *J. regia* × *J. californica* and of *J. nigra* × *J. californica* consistently root more freely than any other selection. As regards pollination some trees do not bear well owing to the fact that the catkins and nutlets are not ripe at the same time. Hence before planting up with one particular kind the grower should be certain that such is not the case or that other trees of a different variety are planted near at hand. Methods of bleaching, curing and storing nuts which have been found successful under English conditions are described.

172. LAVANCHY, GD. 634.51
Le noyer. (**The walnut.**)

Extrait de l'annuaire agricole de la Suisse, 1931, pp. 368-79.

This is in effect a plea for the vegetative reproduction of walnuts, at least of the scion wood. The difficulty of getting wood sufficiently ripe for grafting is stressed and in the author's opinion the only thing to do is, by preventing the tree from bearing, to allow it to expend its energies in wood production, the lower parts of which should become ripe enough each year for use as scion wood. He describes the following methods which have been found successful in Switzerland, namely crown grafting, cleft grafting—with a warning against cleaving the stock too deeply—and the rather more complicated approach grafting, while ring budding is just mentioned as possible. All the above are done in the open. The English practice of bench grafting on root pieces is noted. Commercial varieties suitable for dessert and confectionery are Franquette, Mayette, Chaberte, Parisienne. Graft wood of these is available at the Federal Research Station, Lausanne.

173. TRUNK, C. 634.51-1.541.11
A serious trouble of walnuts.

Western Nutgrowers Assoc. (Oregon), 18th Ann. Rept., 1932, pp. 163-8.

When an early-leaving walnut such as *Juglans nigra* is grafted with a late variety such as Franquette, the parting of the union of the two different barks has been found to occur when the tree is in about the 16th year of growth. It takes about 4 years before this process is completed and the tree dies. It is stated that the trouble is due to the earlier and more rapid growth of the stock. Pressure is set up by the sap in the root, resulting in the parting of the bark of the two different varieties. As a solution of this difficulty, one limb of each of a series of young Franquettes grafted on to *Juglans nigra* stocks, was worked with a Black scion to draw sap from the active roots, thus avoiding a pressure being set up. In the future it is suggested that stocks that come into growth at the same time as the scions should be used. J.B.H.

174. BAILEY, J. E., AND WOODROOF, J. G. 634.521-1.53
Propagation of pecans.

Georgia Exp. Sta. bull. 172, 1932, pp. 22.

Commercial propagation is by budding or grafting on seedling rootstocks. No consistent results have been obtained in attempts to discover the most suitable variety for rootstocks, but the following points have emerged from a series of trials:—(a) at least some one factor plays a greater part in determining vigour of seedling than does variety; (b) there is a period of a few weeks before maturity when practically all nuts have very nearly the same possibilities of producing vigorous seedlings; (c) there are no means by which increased vigour can be added to the natural properties of nuts, but by proper ripening and storing methods inherent possibilities may be maintained. Seed nuts should be stratified immediately after harvest until the spring, numerous storing experiments showing that the temperature and moisture conditions in the soil 6 inches under the surface are the ideal, at any rate in Georgia, and that any deviation from this gives less satisfactory results. Pecans germinated over a fairly wide range of soil acidity and alkalinity, but the highest germination was obtained with a pH of 6.8. On the

whole the trees were more tolerant of alkaline than acid medium. In tests for aiding germination the highest (100%) germination was obtained by treating nuts with ammonia fumes for 1, 2 and 3 days. A 4-days' treatment reduced germination to 80% and 5 days to nil. The percentage for untreated nuts was 76%. A table is given of various other successful and unsuccessful treatments. The position in which the nut lay in the soil was immaterial. Germination was as high in poorly filled nuts as in well filled ones but the subsequent growth of seedlings of the imperfect nuts was more feeble. Misshapen nuts produced perfect seedlings. In budding, the methods are :—ring budding, modified patch or half H, in which half instead of a complete ring is used, thus providing contact between bud and stock at the vertical and horizontal cuts. This is supposed to cause quicker union than when contact is made only along the horizontal cuts as in the complete ring budding. Shield budding is not very satisfactory with pecans. In grafting seedling rootstocks whip grafting is used, and in top-working old trees cleft and bark grafting. For spring budding in March, budwood is taken from the previous season's growth ; summer budding is done with current season's wood, the leaf petioles being cut half an inch above the bud, which should be fresh from the tree. Top-working is of greater value to trees with a trunk of under 10 inches in diameter or under 15 years old. Trees to be top-worked can either be headed back and grafted in February, or new shoots from the cut back branches can be budded in July. The budding and grafting methods are explained in detail, but do not differ sufficiently from accepted practice to note here.

VEGETABLE GROWING.

175. HIRST, F.

Cultivation of vegetables for canning.

Food, 1933, 2 : 181-4, 213-4.

635.1/7 : 664.84

Vegetables for canning are usually grown under contract between canner and grower. The canner supplies the seed at cost price and the grower agrees to plant and cultivate a certain acreage in accordance with the instructions of the canner's fieldman. A good fieldman is indispensable for smooth working between grower and canner. He arranges the time of planting, instructs the grower how to obtain the best yield and when to harvest, keeps an eye on all contract acreages and makes sure that all contract produce reaches the cannery in spite of the possible attraction of a higher market price.

Peas. The characteristics of a good canning pea are uniform ripening, a clear light green colour, and a small to medium size. The most popular varieties at present are the Lincoln whose colour, however, is sometimes too dark, Charles the First, Cannors' Perfection, Thomas Laxton and Prince of Wales. The perfect canning pea, however, has yet to appear. The amount of seed required is about $1\frac{1}{2}$ cwt. per acre when the distance between the rows is 20 inches. An acre of average land should produce about 1 ton 5 cwt. of shelled peas. Full cultural directions are given.

Dwarf Beans should follow a well-manured crop and may be assisted by artificials containing phosphates, potash and nitrogen. They are very sensitive to frost and should not be planted until May. Keeney's Stringless Green Refugee is the one grown for English canners. About 60 lbs. of seed per acre is required for planting 4 inches apart, 26 inches between the rows. To obtain maximum yields the plants should be picked over twice a week. The yield is 120-180 bags per acre.

Beetroot. Canning factories will not be ready for beetroot until September or October. The seed should be sown accordingly. Young well-shaped roots are required and these are best obtained on fertile friable loam, moist but well drained. Pulling should take place 70-85 days after sowing. Four to six lbs. of seed drilled in rows 12-18 inches apart will plant an acre. Thinning is necessary but should be delayed till some of the roots are large enough to use. The best varieties are Detroit, Dark Red and Globe.

Carrots. These must be young. A light friable loam well manured for a previous crop produces the best canning roots. They are not likely to be required till the canning factories have cleared the pea crop, so that the seed should be sown later than is usual. Eighty to eighty-five days are needed for the crop to reach canning size if sown at the usual time in spring. Three pounds of seed drilled in rows 12-18 inches apart sows an acre. With thin sowing the thinning out can be deferred till the largest roots are ready for the factory. The small round bright-coloured varieties are demanded. The best are Early Horn, Selected Stump Rooted, Champion Horn, Nantes Early Stump Rooted, Early Nantes, Chantenay.

Turnips. The best varieties for canning are White Milan, Red Milan, Red Globe. There is not much demand. Turnips are more generally used in canning as a constituent of vegetable macedoine.

Celery. The demand is for canned celery hearts, which are best supplied by the dwarf self-blanching types, though little is known about the best way to grow them. In trials at Campden and in Cambridgeshire last year Dwarf White and Gold Self Blanching were the best, though at Cambridge 60-70% of the latter ran to seed prematurely.

176. JOHANSSON, J. E.

631.544.3

Some experiments in soil heating.*J. Min. Agr.*, 1933, 39 : 1113-6.

The experiments carried out at the Horticultural Institute, Alnarp, Sweden, in the heating of soil in glass frames are described. The methods used were (1) Fermenting materials. (2) The Sigma system or steam in clay drain pipes, cement tubes or impregnated wood tubes (also described in *Gardener's Chronicle*, 1932, 91 : 165). The novelty about this system is the way the steam and air are introduced into the soil. The steam forced through the pipes at low pressure becomes mixed with air and does not condense, but the mingled air and steam is squeezed into the soil through the seams in the wood or clay pipes. Hard water must be filtered. (3) Beck Früs system. Hot water in copper pipes. Eight thin copper pipes, only 6 mm. external diameter, are laid in a bed of gravel at the same depth as electric soil heating cables would be. Two other pipes are above ground under the glass of the frame. Hot water is forced through the pipe system by means of an electrical pump and led back to the boiler by an iron pipe. The water leaves the boiler at a temperature of 80°C. and returns at about 6° C. lower. (4) Hot water system with iron pipes. One-inch iron pipes were used and the water circulated without pumping. The iron pipes, which are encased in ordinary drain pipes of 2½ in. interior diameter, consisted of two flow and two return in a 6 foot wide bed. Melons planted in mid-May were the subject of the experiment. An attempt was made to keep the soil temperature in the frames under the different systems the same. Artificial heating was used from May 15th to July 5th. In the Beck Früs system the hot water circulated 6 hours daily ; in the iron pipes for 12 hours ; the Sigma steam process operated for 1 hour daily. The manure frame with a soil temperature slightly higher than the artificially heated frames for the first week matured its fruits six days earlier and had the largest crop, the relative figures for yield being manure frame 100, iron pipes 89.6, Sigma 80.6, copper pipes 74.4. The considerably higher yield of the manure frame is thought to be due to the greater carbon dioxide content in the air. The Beck Früs and Sigma systems tried in the open air on tomatoes produced an earlier crop than did the unheated soil, but a smaller total weight for the whole crop.

177. READ, W. H., AND ORCHARD, O. B.

631.544 : 632.18

Plant injury following the burning of sulphur in glasshouses.*J. Min. Agr.*, 1933, 36 : 1085-7.

The burning of sulphur to disinfect greenhouses previously occupied by tomatoes or cucumbers before bringing in chrysanthemums has been found to result in injury to the leaves and buds of these plants. The symptoms are dark brown patches accompanied by white deposits around the edges appearing on the upper leaves and petioles. These rapidly shrivel and dry up. Instances are known where the damage to flower buds has caused a complete loss of the crop.

investigation showed that the sulphur dioxide derived from the burning of sulphur, acting on the paint of the houses or, if containing zinc oxide, on the galvanised wire, formed zinc sulphite which subsequently oxidized to zinc sulphate and was thence carried to the plants by drip. Injury can only be minimized by thoroughly hosing down the houses with water at frequent intervals or by preventing drip by maintaining a dry atmosphere. Since the formation of soluble zinc sulphate must cause partial destruction of the paint, the use of naphthalene or formaldehyde instead is recommended.

178. BENNETT, H. D. 635.31
Asparagus.

J. Min. Agr., 1933, 39 : 1116-24, bibl. 5.

Modern methods of commercial culture are described including an account of the special methods necessary for the cultivation and packing of canning crops.

179. MINISTRY OF AGRICULTURE. 635.31
Asparagus.

Min. of Agr., Gt. Britain, bull. 60, 1932, pp. 51, bibl. 7.

Since a tariff has been placed on imported asparagus British growers have shown keen interest in the culture of this crop. To assist them the Ministry has investigated methods of asparagus culture in England, in other European countries and in the United States of America, and gives an account of them in this bulletin. In the course of a short historical survey of the industry it is remarked that in the rich alluvial soil of Mortlake, which from 1800-1870 was a centre for the crop, asparagus grew to such an extraordinary size that 110 heads have been known to weigh 32 lb. The plant is usually dioecious, and since the male plants are more vigorous, giving a greater number of shoots that develop early, while the beds do not become crowded with seedlings, attempts have been made to establish male beds only. In California experiments show that the yield from male plants exceeds that from female plants by 35-50 per cent. The best varieties are discussed. It is considered that there is considerable variation within each variety and that any grower can secure improvement by careful selection of seed and crowns. Desirable characteristics are:—Uniform maturation, hence an early and a late strain should be grown. Vigour. Size of bud, an excess of small buds being very undesirable. Colour and shape: the pointed Argenteuil type is preferred in England. The scales should cover the bud closely, lying flat and overlapping. Methods of seed and crown selection in France and the United States of America are described. Crowns showing strong new roots with a few large buds are the best for planting. Experimental work on asparagus is in progress at (1) the Worcestershire County Council Demonstration Plot, Perdiswell, (2) the Agricultural Institute, Kirton, Lincs. (3) the Royal Horticultural Society's Gardens, Wisley. The Research Station at Long Ashton has dealt with asparagus sickness.

180. SAYRE, C. B. 635.64-1.8
Effects of fertilizers and rotation on earliness and total yields of tomatoes.
New York Agr. Exp. Sta., Geneva, bull. 619, 1933, pp. 50, bibl. 8.

This reports the results of 6 years' experiments comparing 18 fertilizer combinations in a single crop system and in a 4-year rotation. The treatments were replicated 3 times and results were measured by the differences in field yields of tomatoes. Details of lay-out are given as well as methods and times of application. Phosphorus was found to be of the greatest importance in increasing both early and total yields, nitrogen being second and potash third. Continuous cropping had no ill effects for 2 years: afterwards tomatoes in the 4-year rotation obviously benefited. The rotation consisted of tomatoes, snap beans followed by a rye cover crop in the second year, beets third year and peas fourth year followed by a sweet clover cover crop. The best results were obtained, especially for early yields, by the use of well rotted manure supplemented with a complete fertilizer high in phosphorus or with a fertilizer containing readily available phosphorus.

181. SMITH, K. M.
Spotted wilt ; an important virus disease of the tomato.
J. Min. Agr., 1933, 39 : 1097-1103, bibl. 8.

635.64-2.8

This paper is an account of spotted wilt, a virus disease of tomatoes newly recognized in the U.K., though responsible for heavy losses to the tomato growing industry of Australia where it was first observed in 1915. Some symptoms as observed under glass in England are a tendency of young leaves to curl downwards and inwards, followed by the appearance of irregular or circular bronze coloured markings, this bronzing being the most characteristic symptom of all ; plant growth is arrested and a fairly bold yellowish mottling of the leaves may take place. Fruits may show pale rings or ring-like marks. It has been found from experiments on other hosts that the predominant tendency of the symptoms is towards the formation of concentric rings. The insect vector and main transmitter of the disease is a thrips (*Thrips tabaci*), though infection may be carried through such cultural operations as stopping. Evidence is adduced to show that the virus is maintained over the seasons under glass in a number of host plants, commonly housed after tomatoes, one of the principal being *Solanum capsicastrum*. The control of the disease lies mainly in the control of thrips. The following paraffin-nicotine emulsion is recommended for spraying : paraffin emulsion 1 pt., water 10 galls., commercial nicotine 2 fluid ozs. This cannot be used to combat attacks of thrips on the flower. Fumigation may be effected by vaporizing over a spirit lamp $\frac{1}{2}$ fluid oz. per 1,000 c. ft. of space.

182. HADFIELD, J. W., AND CALDER, R. A.
Smooth seeds arising in dimpled varieties of marrowfat peas.
New Zealand J. Sci. and Tech., 1933, 14 : 210-9.

635.656

Smooth seeds appearing among the dimpled varieties when exposed for sale detract from the appearance of the samples and reduce their value for culinary purposes. (Dimpled peas must not be confused with wrinkled peas, which possess starch grains that are quite distinct.) From the evidence brought out during the investigation and given in detail in this paper it is concluded that the occurrence of smooth seeds in Marrowfat varieties is not due to heritable variation within the variety, although the tendency has of course a genetic basis, but is mainly a modification produced by environmental conditions and seasonal variation. Smooth seeds are found in the upper or less mature pods or on lateral branches which give rise to late maturing pods. Several hundreds of pure lines were studied not one of which remained free from smooth seeds. Since the smooth seeds are not due to variation within the variety, ordinary selection methods are not likely to be effective in preventing their occurrence.

The following also are noted :—

DUNN, S. **Relation of hydrophilic colloids to hardness in cabbage, brussels sprouts and alfalfa plants as shown by the dye adsorption test.** *Plant Physiology*, 1933, 8 : 275-86, bibl. 5.

McHARGUE, J. S., AND CALFEE, R. K. **Further evidence that boron is essential for the growth of lettuce.** *Plant Physiology*, 1933, 8 : 304-13, bibl. 3.

WOODS, J. J. **Vegetable growing in the coast area of British Columbia.** *Dominion of Canada Dept. Agr. bull.* 164 (N.S.), 1933, pp. 38.

FLOWER GROWING.

183. MAGYAR, G.
Magyar növényujdonságok. (Hungarian novelties in ornamental plants.)
Kertészeti Szemle, Budapest, 1933, pp. 42-4 and 110-1.

635.9

The following new hybrids are described :—(1) *Billbergia Schneideriana*, a hybrid between *B. nutans* and *B. amoena* together with selections of this hybrid, viz. *compacta*, *latibracteata*, and *tenella*. (2) *Rosa Pernetiana* "Dr. Barcza Ernő", a combination between the *thea* hybrid George Dickson and Madam Edouard Herriot (*Pernetiana*). B.H.

The following also is noted :—

PROCHASKA, M. Beitrag zur Kapsel—u. Samenbildung der Papaveraceen mit Berücksichtigung der Gartenmöhne (**Capsule and seed formation in the *Papaveraceae* with particular reference to garden poppies**). *Gartenbauwissenschaft*, 1930, 3 : 277-84, bibl. 6, and Einfluss der Erntezeit des Mohnes auf den Konsumwert u. die Keimfähigkeit der Samen. (**The effect of time of harvesting on the market value and germination capacity of poppy seeds.**) *Ibidem*, 1933, 7 : 458-66.

PLANT PROTECTION—DECIDUOUS FRUITS.

184. OVERHOLSER, E. L., AND OTHERS. 632.1 : 634.11 + 634.13
Cork or drought spot in apples or pears.
Better Fruit, 1933, 27 : 10 : 5-6 and 27 : 11 : 11, bibl. 8.

A number of factors considered either separately or in conjunction to be responsible for this physiological disease are discussed. These are :—(1) A light crop. The greater vegetative growth that may occur in light crop years may during periods of excessive transpiration withdraw so much moisture from the fruit that groups of cells are killed. Examples are quoted of trees in light crop years whose superabundance of foliage had been much reduced by insect attack producing a much lower percentage of cork spot than trees not so attacked. (2) High temperature during the growing season. (3) Periods of low relative humidity. (4) Strong drying winds. (5) Too close planting resulting in inadequate moisture at the roots. (6) Dry soils. (7) Under or over-irrigation. (8) Root injury through cultural operations, low temperatures or other cause. (9) Increased susceptibility of pears on *Pyrus serotina* (a Japanese rootstock). It is stated that these deductions are mainly from field observations.

185. RAMSEY, G. B., AND LINK, G. K. 635.64 + 635.56 + 635.646 : 632.1/4
Market diseases of fruits and vegetables, tomatoes, peppers, egg-plants.
United States Dept. Agr. misc. publ. 121, 1932, pp. 44, bibl. 115.

This publication is the second of a series designed to facilitate the recognition and identification of pathological conditions of economic importance to those fruits and vegetables which are grown for commercial purposes. Thirty-three diseases of tomatoes are described with the appropriate control measures, 10 diseases of peppers (*Capsicum annuum* vars.) and 4 of egg-plant (*Solanum melongena* L.). Many of the descriptions are supported by excellent coloured plates.

186. SMITH, K. M. 632.8
The present status of plant virus research.
Biological Reviews, 1933, 8 : 136-79, bibl. 293.

The author in his introduction notes the absence of a central source of information on the subject of virus diseases and offers this article in the hope that it, together with his previous article "Virus diseases of plants and their relationship with insect vectors" in *Biol. Rev.*, 1931, 6 : 302-44, will fulfil the need. He outlines the chief methods of approach to the plant virus problem, discussing first the physical properties of viruses. Next the symptomatology of virus-affected plants is considered. Virus transmission is reviewed, being considered under the following heads :—grafting, inoculation, insect agency, seed and pollen. It is noted that so far no plant virus has been cultivated *in vitro*. Certain supposed causal organisms are discussed. In the fifth section investigations on the movement of virus within the plant host are noted, especially those on the virus of aucuba mosaic in the tomato. Further sections deal with metabolism and chemical changes in virus-affected plants and the photography of viruses by ultra-violet light.

Notes are made on the so-called "recovery", "carrying-power", "resistance", and "immunity" of plants affected with virus diseases. Studies on the electric charge of virus particles are summarized. The differentiation of plant viruses is discussed and the author stresses the importance of classifying the virus and not the disease caused by it. Finally, recent work on potato mosaic diseases is reviewed and the present position as regards the potato mosaic group is stated.

187. KUNKEL, L. O. 634.25-2.8

Insect transmission of peach yellows.

Contrib. Boyce Thompson Inst., 1933, 5 : 19-28, bibl. 4.

An attempt was made to transmit peach yellows by *Pseudococcus citri* and *P. longispinus*, *Philaenus leucophthalmus* sp., *Thelia bimaculata*, *Ceresa bubulus*, *Graphocephala coccinea*, *Empoa rosae*, *Jassus olitorius*, *Fieberiella flori*, *Erythroneura obliqua* and the leaf hopper, *Macropsis trimaculata*. Transmission was successful only in the last case and then only in 10% of the trees exposed to the leaf hopper.

188. HARRIS, R. V. 634.75-2.8

The strawberry "yellow-edge" disease.

J. Pom. Hort. Sci., 1933, 11 : 56-76, bibl. 25.

After discussing previous work on "degeneration" diseases in the strawberry the author describes the method by which he was able to transmit strawberry "yellow-edge" symptoms by grafting, at the same time eliminating all possibility of transmission by any insect vector, and demonstrates that this particular disease is of a virus nature. He summarizes the symptoms of the disease as found on Royal Sovereign and notes that analogous symptoms have also been observed in the field on several other varieties. He suggests that control must aim at the elimination of virus-infected runners from the runner beds. This can be done by the control of the natural insect vectors of the virus and by the systematic elimination by roguing of infected plants from the runner beds.

189. BERKELEY, G. H., AND MADDEN, G. D. 635.64-2.8

Transmission of streak and mosaic diseases of tomato through seed.

Scientific Agr., 1932 and 1933, 13 : 194-7, bibl. 11 and 455-7, bibl. 1.

In the first paper it is shown, with details of the experiments leading to the conclusion, that although mosaic and streak diseases of tomato may be carried in the seed, seed from infected plants under identical environmental conditions will sometimes produce uninfected plants. In the second paper the further conclusions are drawn that mosaic is extensively transmitted through seed and that it can be present in the seed of green as well as ripe fruits; also that seed from one truss of a mosaic infected plant will produce progeny that will develop mosaic symptoms, while seed from another truss on the same plant will produce plants which remain uninfected under similar environmental conditions. The reason for this is not yet clear. The mosaic produced by inoculating healthy plants with the crushed embryos of seed from mosaic infected plants is contagious and does not differ from the ordinary form of tomato mosaic.

190. MILLER, P. V. 634.51-2.314

Third report of progress of studies on walnut blight and its control in Oregon.

Western Nutgrowers Assoc. (Oregon) 18th Ann. Rept., 1932, pp. 140-61.

The walnut blight pathogene, *Bacterium juglandis* [*Pseudomonas juglandis*], overwinters, under Oregon conditions, chiefly in diseased buds and in stem lesions. Heavy rainfall results in rapid spread of blight. The use of bordeaux mixture has been found to reduce infection very considerably. Bordeaux at 2-2-50 was almost as effective as at greater strengths. Two applications, made one just before and one immediately after blooming of the female flowers, were found to give the best results. In wet seasons a third treatment, when the nuts are approximately one-half inch in diameter, appears to be necessary. Cumulative benefits from spraying

are indicated. Spray injury frequently followed the application of bordeaux mixture to young walnut leaves. This may be reduced by increasing the lime in the mixture. Preliminary trials of certain preparations said to be relatively non-injurious to the host have been carried out with promising results. J.B.H.

191. MOORE, M. H. 634.11-2.42 + 2.793
Some incidental effects of routine scab sprays, with special reference to apple fruit sawfly control—a sidelight on the interpretation of field spraying experiments.

East Malling Res. Sta. Ann. Rept. for 1932, 1933, A.16, pp. 90-8, bibl. 9.

The author indicates that careful collection and interpretation of all possible data in field spraying experiments can show results which might not otherwise be seen. His data show that some control of apple fruit sawfly (*Hoplocampa testudinea*) was given by fungicides applied to control apple scab, although modifications of existing routine methods for sawfly control are not thereby advocated.

192. MOORE, M. H. 632.42 : 634.13
Spraying trials against pear scab (*Venturia pirina*). Some practical and theoretical aspects of the interpretation of the results.

East Malling Res. Sta. Ann. Rept. for 1932, 1933, A.16, pp. 99-108, bibl. 3.

The author details his results in 1931 and 1932 on Fertility pears worked on known quince stocks. Bordeaux and lime-sulphur gave good "commercial" control, the former controlling late infection better. Colloidal sulphur was unsatisfactory. Rootstock influence on scab susceptibility was apparent.

193. CSORBA, Z. 634.11-2.42
Vizsgálatok az almafajták lisztharmat iránt való fogékonyságának és ellenállóságának okairól. (Investigations on causes of resistance and susceptibility to apple mildew.)

Mezőgazdasági Kutatások, Budapest, 1932, 5 : 327-41.

Thickness of the outer wall of the leaf epidermis is regarded as one factor determining resistance to apple mildew. This is proved by the author. Investigations were carried out both with susceptible varieties: Muskotály Renet (Muscat Reinette), Jonathan, Yellow Bellflower; and with resistant varieties: Török Bálint, Éntz Rozmarin, Téli piros pogácsa (the latter being Hungarian varieties). Leaf material collected in different localities was used. Pieces, taken from different but corresponding parts of different leaves, were embedded in paraffin, and microtome sections, 7μ thick, double coloured with carbol fuchsin and aniline blue, were mounted in Canada balsam. Measuring was done from pictures projected on the screen. Data are presented in 14 tables, conclusions being based on some 5,000 measurements. Differences between different varieties showed consistency, e.g. Muskotály Renet had the thinnest epidermis in every locality compared with other varieties in the same place. The arithmetical mean of the epidermal wall (with cuticle) of susceptible varieties was $2\cdot13\mu$, and of resistant ones $2\cdot67\mu$. B.H.

194. ROBERTS, J. W., AND DUNEGAN, J. C. 632.48 : 634.25
Peach brown rot.

United States Dept. Agr. tech. bull. 328, 1932, pp. 59, bibl. 111.

In this bulletin the numerous papers bearing on various aspects of the disease are reviewed and the authors give an account of their own observations and experiments. Peach brown rot

appears to have been known in America as long ago as 1807, but the first good description was that of Peck in 1881. The fungus causing this disease is *Sclerotinia fructicola* (Wint.), Rehm. [= *S. Americana* (Wormald) Norton and Ezelsiel]. It is the same as that found in Australia and New Zealand, but differs from the two European brown rot fungi, *S. fructigena* and *S. cinerea*. *S. fructicola* is destructive to plums and cherries as well as peaches but it rarely causes serious damage to apples and pears. It not only infects the fruit but also produces blossom-blight, twig-blight and cankers. It passes the winter in mummied fruits and in cankers and these, therefore, serve as sources of infection the following year. The conidia of the *Monilia* stage develop on the fruit left on the trees while those mummies which fall to the ground and become partly buried produce the *Sclerotinia* stage. It is considered that wind is the chief factor in the dissemination of the fungus, but rain, birds, insects and man also aid in the dispersal of the spores. The fungus is able to penetrate the uninjured skin of the fruit, but infection arises chiefly at punctures made by the plum curculio, *Conotrachelus nenuphar* Hbst. The control of curculio is therefore one of the chief factors in controlling brown rot. The writers stress the importance of sanitary measures in the orchards and advise the removal of diseased fruit, the ploughing in of mummies and the pruning out of cankers, in addition to spraying or dusting. They recommend the application of lead arsenate soon after petal-fall, followed later by other applications of lead arsenate with a fungicide, the latter in the form of self-boiled lime-sulphur or sulphur-dust. Experiments were carried out with the object of destroying brown rot spores, in the packing houses or during transit, by means of toxic vapours, but all the materials tried that were effective in this way imparted an undesirable flavour or odour to the fruit. H.W.

195. HARRIS, R. V. 632.482 : 634.711

The infection of raspberry fruits by the cane-spot fungus (*Plectodiscella veneta*).
East Malling Res. Sta. Ann. Rept. for 1932, 1933, A.16, pp. 86-9, bibl. 4.

This fungus is found to cause a deformation of raspberries by infection of the immature fruit. Optimum conditions for successful infection in England are warm weather with intermittent rain in late April and May. Suggestions are made for spraying likely to afford adequate control.

196. ANDERSON, H. W., AND KADOW, K. J. 632.482 : 634.711

Anthracnose and gray bark of red raspberries : identification and control.
Univ. Illinois Agr. Exp. Sta. bull. 383, 1932, pp. 283-92, bibl. 3.

The bulletin presents the results of observations on an apparently new disease of red raspberries noted on Latham in Southern Illinois shortly after its introduction in 1925. Investigations tend to show that grey bark is a phase of a disease similar to or identical with anthracnose (*Plectodiscella veneta*) of black raspberries. It had formerly been considered as a separate disease which had never been described and for which the control was not known. The identity of this disease having been established, control was obtained by a single delayed dormant spray (bordeaux 12 : 12 : 100 or lime-sulphur 1 : 12) which prevented the discharge of spores from the overwintering acervuli.

197. DU PLESSIS, S. J. 632.482 : 634.55

Spraying experiments for the control of anthracnose disease of almonds.
Union S. Africa Dept. Agr. bull. 116, being Stellenbosch-Elsenburg Coll. Agr. farmers' bull. 60, pp. 12.

The investigations tend to show that anthracnose disease of almonds (*Gloeosporium amygdalinum*) in the Western Cape Province can be controlled efficiently and economically by four applications of bordeaux mixture :—(a) on bud movement, 2-3 weeks before blossoming, 4 : 4 : 50 ; (b) when about three-quarters of the petals have fallen, 4 : 4 : 100 ; (c) 10 days after second application, 4 : 4 : 100 ; (d) 14 days after third application, 4 : 4 : 100.

198. BIRMINGHAM, W. A. 634.11-1.541.11-2.48
 Another fungus attacking apple stocks, *Sclerotium rolfsii* Sacc., recorded on Northern Spy in New South Wales.
Agr. Gaz. of New South Wales, 1933, 44 : 58-60, bibl. 5.

This is here stated to be the first recorded instance of an attack by *Sclerotium rolfsii* on apple trees in New South Wales. The disease is reputed to be one of the most serious troubles of young apple stocks in South African nurseries. The stocks die out in patches, it being rare for an individual tree only to be affected.

199. MARTIN, H. 632.952.21
 Studies upon the copper fungicides. II. Some modifications of bordeaux mixture designed to overcome practical difficulties in its application.
Ann. Appl. Biol., 1933, 20 : 342-63, bibl. 18.

The modifications proposed are:—(1) the incorporation of concentrated sulphite lye in the bordeaux mixture, and (2) the glyceride oil emulsion produced by the use of bordeaux as emulsifier. [From author's summary.]

200. JOHANSSON, E. 632.42 : 634.11 + 634.13
 Besprutnings—och bestoftnings försök med fruktträd. (Spraying and dusting fruit trees.) [English summary.]
Contrib. Swedish Permanent Committee on Orchard Research, No. 29, 1933, pp. 14, bibl. 20, being reprinted from *Sveriges Pomologiska Förenings Årsskrift*, 1933, 30 : 1-14.

This is an account of experiments in the south of Sweden in 1931 and 1932 on apple and pear scab control with bordeaux mixture and lime-sulphur sprays, and bordeaux powder, i.e. dehydrated copper sulphate and lime and sulphur compounds as dusts. It is noticeable that the bordeaux dust was effective but caused more severe spray damage on apples than the spray. In normal years sulphur dusts were found comparable in effect to lime-sulphur sprays, though alone they would not appear capable of effectively protecting scab-susceptible varieties in seasons when weather conditions are favourable to the fungus.

201. LOEWEL, E. L. 632.951.4
 Der Anwendungsbereich des Karbolineums als Winterbekämpfungsmittel im Obstbau. Ergebnisse u. Beobachtungen aus den Versuchen des Obstbauversuchsrings des Altenlandes. (The extent of usefulness of carbolineum as a winter spray for fruit. Results and observations of the Altenland Fruit Research Group.)
Gartenbauwissenschaft, 1933, 7 : 496-518, bibl. 18.

Among the author's conclusions based on several years' experiments, an account of some of which is given, are the following: Carbolineum at proper concentrations and applied at the proper time can be used for the control of certain insects and for removal of moss. Growth at first checked is later encouraged by the treatment. Its destruction of insects indirectly controls *Fusicladium* by removal of the good medium for fungus growth afforded by insect excretions. The foliage becomes more resistant to post blossom sprays as the result of carbolineum treatment. The later the application of carbolineum, the more certain is insect destruction. Provided ample spray material is used, a 7-8% solution suffices. Highly concentrated carbolineums may be considered similar in their effect to normal carbolineums. Sulphur preparations cannot replace it. If winter washing is omitted other insects can still be controlled in various ways, but the apple blossom weevil is then beyond hope of control. [English experience shows that even the apple blossom weevil can only be partially controlled by winter wash and then only if a concentration of not less than 10% is used. Ed.] A combined spraying with carbolineum and bordeaux does not detract from the efficacy of either.

202. MERWE, C. P. v. D. 632.752
Pernicious scale.
Union S. Africa Dept. Agr. bull. 118, 1932, pp. 11.

The author gives a short account of *Aspidiotus perniciosus*, commonly known as San Jose Scale, its depredations and control in South Africa.

203. MASSEE, A. M. 632.654.2 : 634.75
Further observations on the strawberry tarsonemid mite (*Tarsonemus fragariae* Zimm).
East Malling Res. Sta. Ann. Rept. for 1932, 1933, A. 16, pp. 117-31, bibl. 38.

(1) Details of the distribution of the mite in this country and continental Europe are given, together with a list of the various host plants of the mite. (2) Notes on the various stages of the life-cycle, which are important from the economic aspect are described in detail; the type of damage caused to established plants and runners is referred to; and a list is given of the commercial varieties subject to attack. (3) Control measures are referred to in some detail, and it is shown that such measures as the spraying of established plants, dusting, dipping of runners before planting and the fumigation of the plants with hydrocyanic acid gas have not proved to be efficient for several reasons. (4) Preliminary trials in which the runners are sterilized in hot water before planting are described, and it is indicated that this method of treating the plants may be of considerable importance in the future. (5) The possible association of the strawberry tarsonemid mite with other strawberry diseases is also referred to briefly. (Author's summary.)

204. REKK, G. F. 634.1/7-2.76 + 2.753
Methods of chemical control of certain root pests of fruit trees. [Russian-English summary.]
People's Commissariat of Agr. SSR. Georgia, Pomological Exp. Sta. bull. 1 (Division of Plant Protection), 1932, pp. 48, a few references.

The work was undertaken to ascertain the most effective methods of control of (1) Flat-headed borer, *Capnodis tenebrionis* L, the larvae of which attack the roots of apricots and other fruit trees, while the beetles destroy the bark and leaf petioles in the upper part of the tree. (2) Pear-root aphid, *Eriosoma lanuginosum* Harty. Against the borer paradichlorobenzene, placed round the tree in a furrow 8-10 cm. in depth, with a radius of 10-13 cm. from the trunk and covered with earth destroyed 95% of the larvae. The doses tried were 32 and 64 grams per tree. Carbon bisulphide and calcium carbide proved ineffective. Against the root aphid, however, neither paradichlorobenzene or calcium cyanide proved effective, the former probably because of the decreasing soil temperature (Aug.-Sept.), Carbon bisulphide inserted in the soil in small holes to a depth of 8-10 cm. at a dosage of 70 gr. per sq. m. produced a 98% mortality.

205. MILES, H. W. 632.943 : 632.793 : 634.11
Dusting for the control of apple sawfly : a preliminary experiment.
J. Min. Agr., 1933, 39 : 1125-8.

In control of apple sawfly with nicotine spray, accurate timing of the spray has been found to be necessary to catch the hatching and migrating larvae. Since the time for spraying depends on the flowering period of the apple, control by this means is difficult with mixed varieties. An alternative method was sought, and this paper describes dusting experiments carried out in 1932 at the Cheshire School of Agriculture. The dust used was 30% pure naphthalene, and the variety Worcester Pearmain was selected on account of its susceptibility to sawfly attack. The trees were 8-9 ft. high bush type with a branch extension of 6 ft., divided into alternate blocks of 3 for dusting and control. The dates of application were May 24th (10-20% of blossom open), May 28th, June 3rd, June 6th. The rate of application was 3 lbs. of dust to 20 trees on each occasion. The dust adhered well and its smell was evident for several days after using. In the first count, using the centre tree only of each block, less than 2% of dusted trees were

infested as against over 12% of the control. A later count when no further infestation was probable gave 7% attack for treated trees and 25% for the controls. It is thought that the effect of dusting was apparent even on the control, since other varieties of fruit trees growing further off showed a 30-40% infestation.

206. STEER, W. 632.754 : 634.11

Two apple capsid spraying trials and some notes on spray damage.

East Malling Res. Sta. Ann. Rept. for 1932, 1933, A.16, pp. 132-40.

Good control was got both with proprietary oil emulsions and with tar petroleum washes of known characteristics, emulsified in a uniform way, but serious bud injury was caused by the latter. An account is also given of the use of the two sprays on various small fruits commonly used as undercrops. [From author's summary.]

207. STEER, W. 632.76 : 634.71

Studies on *Byturus tomentosus* Fabr. III. Further experiments on its control on raspberries, loganberries and blackberries.

J. Pom. Hort. Sci., 1933, 11 : 19-38, bibl. 2.

- KEARNS, H. G. H., AND WALTON, C. L. 632.76 : 634.71

The control of the loganberry and raspberry beetle (*Byturus tomentosus*). Experiments with pyrethrum and derris washes and dusts.

Ibidem, 1933, 11 : 39-52, bibl. 9.

- KEARNS, H. G. H., AND WALTON, C. L. 632.76 : 634.71

A note on the control of the raspberry beetle (*Byturus tomentosus* Fabr.) by means of a barium silicofluoride wash.

Ibidem, 1933, 11 : 77-80, bibl. 7.

These three articles discuss the results of trials with various derris and pyrethrum preparations as a control of the raspberry beetle on those plants. Briefly they indicate that to obtain the same measure of control derris washes are considerably cheaper than pyrethrum, and that derris dust gives a useful but inferior control to that got with derris wash of 0.005 and 0.004% rotenone content. Since, however, both pyrethrum and derris depend for their effect on the presence in them of organic compounds, which cannot so easily be stabilized or standardized as inorganic compounds, experiments with barium silicofluoride were also undertaken in the hope that this compound would provide adequate control. The results were sufficiently encouraging to continue the experiments in order to determine the range of effective dilution of the wash and to get data on the residue left on mature berries.

208. KEARNS, H. G. H., AND WALTON, C. L. 632.76 : 634.711

The adult raspberry beetle as a cause of serious blossom injury.

J. Pom. Hort. Sci., 1933, 11 : 53-5, bibl. 4.

The larva of this beetle (*Byturus tomentosus*) is the most serious pest of the raspberry and loganberry. Lately complaints on damage by the adult have been investigated. Observation in the Long Ashton plantations showed that crop weights in 1932 were reduced more by adult damage than by that caused by the larvae. The season favoured the assembly of large numbers of beetles on raspberries and loganberries, having migrated there from the apples and arriving before flower opening. The damage done could be classified as follows :—(1) the biting through of the peduncle of young buds ; (2) the eating away of the unopened bud ; (3) the eating away of the stamens and the nectaries of the open flower ; (4) the destruction of the entire flower except the sepals ; (5) the eating away of the berries in varying degrees.

209. PERCIVAL, G. P., AND POTTER, G. F. 634.11-2.951.23

Amount and variability of spray residue on New Hampshire Baldwins.

Univ. New Hampshire Exp. Sta. tech. bull. 49, 1932, pp. 15, bibl. 14.

The study was begun in 1927 to determine the amount of lead and arsenic on Baldwin apples at time of picking. The methods of determination and calculation are given in detail. The

conclusions are drawn that in orchard practice the date of the last spray application and the amount of rainfall between the date of application and harvest are factors of maximum importance in determining whether the residue will be sufficiently great to render washing and cleaning necessary before marketing. Sampling procedure as usually carried out in most inspection work appears to be sufficiently inaccurate to necessitate the grower keeping his arsenical residues down to three-fourths of the official tolerance in order to be on the safe side.

210. THOMAS, P. H., AND RAPHAEL, T. D. 632.951/2 : 634.1
Orchard sprays for pome fruits.
Tasmanian J. Agr., 1932, 3 : 145-53.

This is a short discussion of the use, composition and application of the more generally used sprays in Tasmania to-day.

211. GARDNER, C. A. 632.51
The blackberry or bramble (*Rubus fruticosus* L.).
J. Dept. Agr. Western Australia, 1932, 9 : 533-5.

This paper deals with methods of eradication of the blackberry which is scheduled as a Noxious Weed in W. Australia. The most successful method has proved to be spraying with a 10% solution of sodium chlorate when the plants are in full leaf. The poison is absorbed by the leaves and carried into the roots, hence a fine spray should be used and as much of the foliage as possible moistened. The maximum effect of the spray will be produced in about 4 weeks and no cutting or burning operations should take place till then. Clumps of blackberry 6 ft. high and 20 ft. in circumference were completely eradicated by officers of the Department of Agriculture by the following method. A spraying with 10% sodium chlorate was followed in 6 weeks' time by burning, which destroyed any young shoots that had appeared subsequent to the spraying. A few weeks later a further spraying with the same solution completely killed the plants.

The following also are noted :—

SILVESTRI, F. Rapporto tra insetti di piante spontanee e piante coltivate. Lotta biologica contro piante dannose. (**The relation between insects of wild plants and the growth of cultivated plants. Biologic control of obnoxious plants.**) *L'Italia Agricola*, 1933, 70 : 91-119, bibl. 7.

WILCOXON, F., AND HARTZELL, A. Some factors affecting the efficiency of contact insecticides. III. Further chemical and toxicological studies of pyrethrum.

Contrib. Boyce Thompson Inst., 1933, 5 : 115-27, bibl. 14.

THOMAS, P. H., AND RAPHAEL, T. D. Red spider. Further control experiments. *Tasmanian J. Agr.*, 1933, 4 : 4-9.

MILES, H. W., AND OTHERS. On the ecology and control of slugs.

Repr. Ann. Applied Biology, 1931, 18 : 370-400, bibl. 19.

CITRUS.

212. L'ITALIA AGRICOLA. 634.3(45)
Numero speciale dedicato alla agrumicoltura. (**Special Citrus number.**)
L'Italia Agricola, 1933, 70 : 3 : 203-380. [Obtainable from Ramo editoriale degli agricoltori, Palazzo Margherita, via Vittorio Veneto, Rome. Price liras 3.50 plus postage.—ED.]

This is the second special number devoted to citrus growing, the first having been published in 1928. Both would appear to play their part in the Fascist Government's plan to revive this most important branch of Italian agriculture which was being outstripped by competition from overseas. It contains the following articles, those dealing with actual cultivation practice being mainly about conditions, methods, etc., obtaining in Sicily. Production and exports in

the last three years.—Foreign competition in the citrus market.—Citrus products and problems connected therewith.—Nursery production in Sicily.*—The establishment of citrus plantations.—Citrus irrigation problems in Sicily.—Notes on lemon production.—The oranges of Sicily.—Mandarin production.—The introduction of new varieties.*—Ornamental varieties.—Recent investigations on diseases of citrus in Italy.*—Pest control and citrus production.—Exportation methods in Italy and in other producing countries.—The organization of producers with a view to profitable marketing of citrus products.

213. EVERETT, P. 634.3(931)

Citrus fruit species and varieties in New Zealand.

New Zealand J. Agr., 1933, 46 : 98-102.

Oranges. Over 20 different varieties are grown including the leading commercial varieties of the orange growing countries of the world. Ruby Blood is one of the sweetest and best for home orchards with Best's Seedless for mid-season and Valencia Late to provide succession of fruit. *Lemons.* Of the dozen distinct lemon varieties grown Lisbon and Eureka are the most popular for commercial planting. The Meyer dwarf variety, comparatively recently introduced from N. China, is more frost resistant than the others, being reputed to withstand 12° of frost. Although less acid than is desirable, it is recommended for the home orchard in cool districts. *Grapefruit.* Marsh Seedless will thrive and crop where lemons succeed, but is lacking in flavour and develops a very thick rind and pith under New Zealand conditions. *Mandarins.* Eighteen varieties or their hybrids are grown, but although palatable, the best cannot be considered to compare well with imported fruit of the same variety. The characteristic high sugar content of the juice is invariably lacking. Recommended varieties are Oonshiu [presumably the Satsuma.—ED.], which is more resistant to frost than any other edible citrus fruit, and Emperor. *Limes.* The Rangpur lime withstands cold to the same extent as lemons, other lime varieties being more tender. *Kumquats.* These are used mainly for preserving and crystallizing and so are not extensively grown. The Marumi is a suitable variety. *Citrons* will grow fruit of a very large size. Bengal Giant and Citron of Commerce are recommended, the latter being the more suitable for candied peel. *Shaddocks.* The Manilla is best suited to the climate. It is mainly used for preserving and for candied peel. Citrus thrive best in the eastern coast areas of Auckland. They are not suitable for the colder parts of New Zealand.

214. BRUNO, F. 634.323(458)

Sull' introduzione di alcune varietà di agrumi. (**New citrus introductions into Sicily.**)

L'Italia Agricola, 1933, 70 : 323-7, bibl. 15.

This article is chiefly important as showing the possibilities of grapefruit production in Sicily. It is stated that all doubts of the ability of the grapefruit to stand Sicilian winters or to ripen properly there have now been dispersed. The varieties which have so far been introduced and appear to offer the most chance of successful production are Duncan, McCarthy, Triumph, Marsh Seedless. A great future is prophesied for this fruit in Sicily.

215. CASELLA, D. 634.3(458)-1.537

Produzione vivaistica nella agrumicoltura siciliana. (**Citrus nurseries in Sicily and their methods.**)

L'Italia Agricola, 1933, 70 : 239-48.

The most important nurseries are in the Province of Messina, in the North-east of the island. They extend over some 400 acres and belong to a very large number of owners who have hitherto been most reluctant to combine in any way. Their methods are, however, similar and an account is given of them here with comments. The most usual stock is the sour orange. The chief routine points would appear to be as follows. The seeds are extracted from oranges picked

* Separate abstracts are given of these. Nos. 215, 214 and 222.

between November and February and are sown as soon afterwards as possible. If it is necessary to delay sowing, they should be washed, dried in the shade under properly ventilated conditions and stratified in sand or, better, in coal dust. After stratification they should be soaked for a few hours before sowing. Special care is paid to the provision of well-aerated seed beds. The best times for sowing are November to mid-January. Preferably but not usually the seeds are sown in rows. Some form of protection from the sun is recommended until the seedlings possess 2 or 3 leaves. Irrigation by submersion is done carefully from the beginning of July till the autumn rains, at fortnightly intervals in the case of ordinary nursery soil and weekly intervals in very sandy soil. The beds are kept clean and the application of poultry manure or nitrate of lime in June and August may be advisable. The larger seedlings possessing 4 leaves are picked out and set in another bed in June to July at distances of 10 cm. from one another. With reference to these plants the author writes as follows:—"They must be irrigated with great care, sparsely, and at the proper time, or are liable to die. As a result of proper selection and early transplanting they will be found to grow uniformly and rapidly, gaining a year over those left in the seed bed. They demand, however, a second transplanting owing to the consequent development of a long taproot, especially in a deep soil." Removal from seed bed to nursery generally takes place after one year, sometimes after two. Common practice in the nursery is to plant at 15-20 cm. between trees and 35 cm. between rows. The author considers that for the better development of both top and root growth 40 cm. and 60 cm. would be preferable distances. The best time for transplanting to the nursery proper is March to April. Copious irrigation immediately precedes removal from the seed bed and entry into the nursery. The plants are pruned at this juncture by severing the trunk at 12-20 cm. from the collar and the tap root at 10-15 cm. from the collar. Plants may be worked when their circumference is not less than 5 cm. at the collar. Generally in Sicily budding is done in the original nursery but a second transplanting is advisable especially for plants in deep soil for the removal of coarse roots and encouragement of fibrous rooting a year before budding. The usual Sicilian method of working is shield budding, though crown grafting is preferred in Campania, the former producing a worked plant at 3-4 years, i.e. 2 years sooner than the latter. Notes are given on methods of budding and on treatment of worked plants when removed for sale 12-24 months after budding.

216. ROTMAN, A.

634.3 : 581.144.2

On citrus root growth.

Hadar, 1933, 6 : 5-6, bibl. 4.

The author summarizes certain work on citrus root growth by Crider, Waynick and Walker, Girton, Halma, dealing with the cyclic root growth (or periodic alternation of growth between shoot and root) in citrus, and the tree's soil aeration, temperature and moisture requirements. He considers that a study of these factors should furnish a criterion for the time, method and depth of water application and for such operations as manuring, transplanting, ploughing, etc.

217. NELSON, E. K., AND OTHERS.

634.31 : 581.192 : 546.17

Nitrogenous constituents of Florida Valencia orange juice.

Fruit Products J., 1933, 12 : 231-5, 250, bibl. 21.

The distribution of the small amount of soluble nitrogen in orange juice has been studied. Half of this nitrogen is present in amino form. The effect of various precipitating agents on the removal of several forms of nitrogen has been studied and tabulated. Examination of the nitrogenous constituents of orange juice resulted in the identification of stachydrine, arginine, choline, asparagine and aspartic acid. Evidence of the presence of histidine was obtained. Mixtures of amino acids were obtained from which no definite pure compounds could be isolated. No changes were detected in the nature of the bases present in the deteriorated juice from those in the fresh juice. [Author's summary.]

218. HAAS, A. R. C. 634.3-1.811.9

Injurious effects of manganese and iron deficiencies on the growth of citrus.

Hilgardia, 1932, 7 : 4 : 181-206, bibl. 26.

The material used was rooted cuttings of rough lemon, lemon (*Citrus Limonia*) and orange (*C. sinensis*) grown in culture solutions in shallow enamelled pans for a year or more. Budded trees in large sand cultures were also used. Among conclusions reached are the following:—Manganese is necessary for healthy growth of citrus cuttings in culture solutions. As the result of manganese deficiency the leaves become yellowish-green or chlorotic but do not mottle. Gum or resinous spot occurs on either or both sides of the leaves. Oil glands in the leaves are not affected. Manganese deficient leaves in acute stages fall prematurely and the shoots die back. The roots remain healthy in appearance. Excessive manganese concentrations also cause chlorosis, even though iron is added to the culture solution in similarly large amounts. Iron is also essential and its deficiency causes chlorosis. When manganese is deficient, the accumulation of iron in the leaves is generally less. Mottle leaf has not been shown to be due to iron deficiency. Neither manganese nor iron can replace one another. In any study of manganese deficiency it must be remembered that most compounds of iron contain manganese as an impurity.

219. PROVAN, J. L. 634.3-1.541.5

Budding citrus trees. Methods described.*

J. Agr. Victoria (Australia), 1933, 31 : 58-63.

An illustrated article describing the technique of citrus budding under Victoria conditions. The article, owing to its clarity of description, will prove useful for reference elsewhere than in Victoria if due allowance is made for seasonal and climatic differences.

220. UPHOF, J. C. TH. 634.3 : 581.145

Wissenschaftliche Beobachtungen und Versuche an Agrumen. V. Die Periodizität der Knospenentwicklung. (Notes and experiments on citrus varieties. Periodicity in bud formation.)

Gartenbauwissenschaft, 1933, 7 : 411-20, bibl. 6.

The author notes that bud development has been found by him to be very similar in the different cultivated citrus varieties. Hence most of the varieties examined by him in Florida were in these later experiments submitted to superficial examination, only one or two being subjected to the closest scrutiny at all stages. He found that citrus varieties in mid-Florida go into the rest period about the end of October, at which time the buds are very much more inconspicuous and rudimentary than those of many other deciduous woody plants. He gives an account of observations made from the end of October till March, illustrating his findings adequately with drawings of sections of buds viewed through the microscope at every stage. As regards the subsequent formation of the micro- and macro-mother cells his observations (which are not given here) on particular varieties of lemon, orange and grapefruit confirm those of Osawa on the Unshiu mandarin and the Washington Navel. [Osawa, I. Cytological and experimental studies in citrus. *J. Coll. Agr., Imp. Univ. Tokyo*, 1912.—ED.]

221. CALIFORNIA FRUIT GROWERS EXCHANGE. 634.3-1.562

Cleaning citrus fruit.

Research and Field Dept. bull., October, 1931, pp. 36.

In an introductory note it is stated that in view of the inability of many of the smaller packing houses in California to clean their fruit successfully, an investigation of cleaning methods was undertaken. This included in its scope an analysis and comparison of the numerous detergents in use, a study of the various types of foreign matter on the fruit and the ease of their removal, a survey of washing equipment and a comparison of the efficiency of various washing units.

* The author has supplied the Bureau with a number of reprints which are available gratis on application.

The improved appearance of fruit washed in soft water alone justifies the expense of a softener. A table of comparison is given of the various methods used for softening water containing 165 parts per million of hardness and of the amounts of various soap products required to bring 100 galls. of water to a suds point. The composition of a number of soaps and soap powders is described, and a study is made of the relative efficiency of the various alkaline cleaners or soap aids, as also of soap products, 24 commercial brands of the latter being tested. The interesting fact emerged that the efficiency of the soap products was more or less proportional to their anhydrous soap content. The bulletin concludes with instructions as to the best method to be followed to ensure thorough cleaning of extremely dirty fruit.

222. SAVASTANO, G. 634.3(45)-2.4/7
 Gli sviluppi più recenti delle ricerche sulle malattie degli agrumi in Italia.
 (Recent investigations on citrus diseases in Italy.)
L'Italia Agricola, 1933, 70 : 343-7, bibl. 3.

The author discusses in some detail the most important diseases and their control. They include Root Rot (*Phytophthora citrophthora* Sm. et Sm. and *P. parasitica* Dastur), Mal secco (*Deuterophoma tracheiphila*). When replanting lemons in infected zones Professor Petri recommends double working the sour orange stock with mandarin as the middle stock. This, being resistant, will stop the fungus from reaching the sour orange. The use of such a resistant lemon as the "Interdonato" variety is also advised. Legislation is already in existence to check and if possible prevent the entry of the following diseases and pests:—*Lepidosaphes gloveri*, *Aleurodes citri*, *Bacterium citri*, *Corticium salmonicolor*, *Sphaeropsis tumefaciens*, *Gloeosporium limeticolum*.

223. MILLER, R. L., AND OTHERS. 634.31-2.951.23
 Effect of lead arsenate insecticides on orange trees in Florida.
U.S. Dept. Agr. tech. bull. 350, 1933, pp. 20, bibl. 17.

The work here recorded was done in connection with strenuous efforts being made to eradicate the Mediterranean fruit fly (*Ceratitis capitata*) from Florida by means of arsenical sprays. The authors describe the effects of spraying orange trees with varying amounts of arsenic on the chemical composition of leaves, wood, blossoms and fruit and on the arsenic content of the top 2 inches of soil. They find that the effect of arsenic is not systemic, only the sprayed part of the tree being affected. The effects of spraying are shown almost immediately and persist to a slight degree for about 18 months. The presence of soluble arsenic on the leaves was found to stimulate respiration. When soluble arsenic was present at 0.01 mg. of arsenic trioxide per 10 g. of leaves, catalase activity was stimulated, but its presence in greater quantities resulted in decreased catalase activity. The presence of arsenic on the leaves resulted in less acid being formed in the fruit, and what was formed disappeared more rapidly than in the unsprayed fruit. When as much as 0.01 mg. total arsenic trioxide was present on 10 g. green leaves at maturity, the maximum reduction without injury to the tree in fruit acid was produced. The pH of the fruit juice from sprayed trees was lower than that from unsprayed trees. The solids of fruit juice were also affected by arsenic spraying. When as much as 0.01 mg. arsenic trioxide per 10 g. leaves was present, the ratio of acids to solids was little above normal, but a slight increase over this caused the ratio to rise to 20 to 1. When so much arsenic was present that the leaves dropped, the arsenic was eliminated from the trees and the fruit was less affected.

224. BRITON-JONES, H. R. 634.3-2.48
 The control of scab disease (*Sporotrichum citri*, Butler) in the British West Indies.
Trop. Agriculture, 1933, 10 : 40-42.

It was noticed that whereas scab seriously affected nurseries of young sour orange seedlings (grown for stocks) in the drier districts of Trinidad having a rainfall of approximately 60 inches per annum, in the more elevated districts with a rainfall of 100 inches and in consequence with

an average cooler atmosphere scab was almost completely absent. An experiment was carried out in which an attempt was made to imitate in a drier district the cooler conditions of the scab-free wet districts, by means of shade. The lay-out consisted of 8 plots, each 30 by 8 ft., laid out in lines 8 ft. apart and planted with alternate rows of sour orange seedlings and ginger, 5 plants to a row, 12 inches between the plants and 18 inches between the rows. Each plot contained 70 sour orange seedlings and 75 ginger rhizomes. The ginger was included to study the effect of shade on leaf spot disease (*Colletotrichum zingiberæ*) and to assist in conserving moisture round the citrus. Alternate plots were shaded with a roof of coconut leaves raised 4 ft. 6 in. above ground. This artificial shade was preferred to natural shade in order that shade might be the sole factor without introducing the complication of root competition. An examination 10 weeks after planting showed that of the unshaded trees 67·5% were sufficiently badly attacked to require trimming, while of those under shade only 33·6% had to be trimmed. A further examination a few weeks later showed that only very few of the shaded plants were now affected by scab at all, and those few but slightly, and always in association with a thinning of the shade. It is to be noted that the seedlings used were all seriously affected with scab when planted and the author considers that had they been shaded earlier in life the control over scab would have been complete. In practice natural shade with living plants is recommended. The shade plants must also be of a kind able to stand ratooning when the citrus stocks are budded. The leaf spot disease of ginger was also markedly controlled by shade.

TROPICAL CROPS.

225. LEAKE, H. M. 333.5

Studies in tropical land tenure.

Trop. Agriculture, 1933, 10 : 48-53, bibl. 11 and 10 : 74-9, bibl. 13.

Continuing this series the first reference deals with land tenure in Nigeria, Sierra Leone and the Gambia ; the second reference is concerned with Fiji. Land tenure in the following countries has been dealt with in previous numbers :—Uganda, Nyasaland, Tanganyika, Gold Coast, India, West Indies, Malaya, Ceylon, Kenya.

226. WALTON, G. 634.1/7(689)

Fruit culture in N. Rhodesia.

Northern Rhodesia Dept. Agr. 2nd ann. bull., 1932, pp. 21-4.

The article is written for the purpose of assisting intending planters in their choice of fruit varieties and in their subsequent cultivation in N. Rhodesia. The climate is subtropical. A sheltered situation with an easterly aspect and a gentle slope to facilitate irrigation is the ideal. A loamy soil of good depth is desirable. The most suitable quick growing tree to form a wind break is *Cassia siamea* closely planted in several rows 6 ft. apart. The seed should be sown *in situ* early in the rains ; further watering will not then be required. A list of suitable subtropical fruit trees (all the more common sorts) is given with cultural notes for each. Deciduous hardy fruits can be grown in the colder parts of the country but they cannot be said to fruit freely though growth is good. The apple varieties recommended for the climate are Rome Beauty, Versveld and Ohenimuri (Monro's Favourite) with White Winter Pearmain to pollinate it. Pears—Keiffer Hybrid interplanted with Le Conte. Strawberries—Laxton's Noble and Royal Sovereign.

227. OLDS, G. D. P. 634.1/7(595)

A survey of fruit production in Malacca Territory.

Malayan Agr. J., 1933, 21 : 56-65.

The article opens with a general account of the manner in which the method of enquiry known as the Survey Method should be conducted, and of the modifications necessary for its application

to Malacca Territory. The result of the survey was to give a clear idea of the position of the fruit industry, its methods of cultivation and marketing. At present it is a primitive industry suffering from haphazard cultivation and from being on too piecemeal a scale to admit of co-operative marketing. An excessive number of middlemen tend to lower the selling price and increase the retail price. There is, however, definitely a market for good quality local grown fruit in Malaya.

228. PARSONS, T. H. 634.65/66(548)
The cultivation of fruits in Ceylon with cultural details. VII Group B,
VIII Group C, and IX Group D.

Trop. Agriculturist, 1932, 79 : 331-5 ; 1933, 80 : 3-10, 73-8.

Pomegranate (*Punica granatum*). The poor type of the present varieties in Ceylon, said to be due to degeneration through careless cultivation, makes it scarcely worthy of inclusion among edible fruits. Foreign varieties said to be of some merit, however, are "Wonderful" in California, and "Bedana", a Kabul form of large size, reputed to be juicy and almost seedless. Considering that the interior of the average pomegranate is almost entirely composed of seeds, a seedless type would imply considerable improvement. Propagation is best done from suckers which are produced freely at the base, their abundance in fact being probably a cause of the plant's deterioration in fruit quality. In pruning, the aim should be to form a tree with 4-5 branches 3 ft. from the ground, not overcrowded. The root suckers must be removed.

Cashew Nut (*Anacardium occidentale*). The tree is semi-naturalized and is raised from seed without trouble. It can often grow where no other crop will, and since there is a wide foreign market for prepared kernels, its cultivation should prove remunerative.

Jujube (*Zizyphus Jujuba*). The Ceylon varieties are inferior to the large fruited variety cultivated in China. It will grow almost anywhere except in wet soils. It is normally raised from seed which must be cracked or filed before sowing. The wild plant should make a suitable rootstock. . . .

The fruits dealt with above are suitable for low-country dry and semi-dry zones (preferably under irrigation). The following are for the mid-country wet zone, 1,500-4,000 feet.

Avocado (*Persea gratissima*). Propagation should be by budding. The local common variety gives good results as a stock for the West Indian varieties up to 4,000 ft. From 4,000-5,000 ft. the Mexican stock is required. At Peradeniya the shield bud, 1½ in. in length as used for rubber, has been more successful than T-budding or grafting. The tree is a gross feeder and requires liberal dressings of well rotted manure forked into the soil just prior to each monsoon. A list of varieties suitable for Ceylon is given.

Ceylon Gooseberry (*Aberia Gardneri*). A small dioecious tree endemic to the moist parts of the Island between 1,000 and 4,000 ft. Propagation is by seed, fruit being obtainable 4 years after sowing.

Guava (*Psidium Guajava*). There are numerous cultivated forms. Propagation is by seed, cuttings or layers. In Florida it is budded by the shield bud method on very young seedling stocks during the cool months. It can also be propagated by severing the surface roots. The severed portion will soon form shoots, and when these are 8 in. high it can then be transplanted. A note on Passion fruit (*Passiflora edulis*) is also given. In the mid-country semi-dry zone, at 2,000-4,000 feet, the fig (*Ficus Carica*) can be successfully grown. The soil should be heavy, retentive of moisture, but well drained, a light dry soil tending to attack by nematode worms. Propagation is from cuttings of well ripened shoots of the previous year or older. The cutting should contain 3-4 good buds and be about 6 inches long. *Diospyros Kaki*, the Japanese persimmon, is another good plant for the same region as the fig. There are a large number of varieties and those selected for propagation should be self-fertile, practically seedless and sweet when ripe. Propagation is by budding or grafting, generally low down on *Diospyros Lotus*, the date plum, or on own seedlings.

229. NIGERIA, DIRECTOR AGR. DEPT. 631.523(669)
The work of the plant breeding section of the Nigerian Agr. Dept.
Stencilled report, pp. 14, 1933.

Northern and Southern Nigeria are dealt with separately. A large number of crops are under investigation, those with which this Bureau is concerned being grown principally in Southern Nigeria. The main centre of investigation there is at Ibadan.

Oil palm. Selection was begun in 1927. Among the problems are :—(1) the production of a strain of high-yielding palms so that superior seed will be available for establishing Native plantations ; (2) the elucidation of the inheritance of fruit form, with the object of establishing plantations true to type for their character ; (3) general developmental study ; (4) determination of the respective merits of the different varieties. Details are given of the layout of the experimental plots, and of the progress already made.

Cacao. Selection work began in 1930. Several trees thought to be genetically superior in yield have been selected from the small number of recorded trees available. The seed resulting from self-fertilization of these trees in 1932 has been planted. In 1933 the value of cross pollination as opposed to self pollination will be investigated. Other work on cacao concerns the discovery of a suitable technique of controlled pollination, methods of vegetative production, correlation of size and weight of beans with the number of pods for individual trees.

Kola. The problems being considered in the improvement of kola are yield and the colour of the cotyledons. Results are not yet available, since until 1930 no individual records of yield or type were available. Systematic work on the technique of controlled pollination can now be undertaken on lines similar to those employed with success in cacao.

Citrus. Tests of grapefruit and orange on eight different stocks have been established ; the local demand for citrus fruit exceeds the supply so that, although the possibility of obtaining exportable fruit will be kept in view, the main problem is to provide the best possible strains to suit local demand. Disease and pest susceptibility will be closely watched.

Coffee. At present selection cannot be undertaken, but different varieties are being collected and planted. The main problem will be to obtain a coffee superior in flavour (and therefore in price) to the indigenous Liberian types, which will grow under Southern Nigerian conditions.

Bananas and Pineapples. Type collections are being made and grown.

Miscellaneous perennials of local economic importance are being collected and grown to provide a reserve of material in case of future investigations.

230. BRITON-JONES, H. R. 632.951/952
Preliminary trials with a combined insecticide and fungicide.
Trop. Agriculture, 1933, 10 : 80-84.

The wash here discussed is one prepared in Trinidad under the name of Sulphemulsol and is an oil-sulphur compound stated to be very effective as an insecticide with every probability of proving equally so as a fungicide. A detailed account is given of experiments with various pests and crops.

231. GILBERT, S.M. 633.61
Sugar cane variety trials, 1932.
Dept. Agr. Trinidad and Tobago bulletin, 1933, pp. 64.

The results to date are given of co-operative trials of varieties of sugar cane, arranged between local sugar estates and the Department of Agriculture in 1929. The objects are :—(1) to compare the yields of cane and sugar per acre from selected varieties, both introduced and locally bred ; (2) to obtain information in regard to the optimum time of harvesting the varieties under trial as regards yield of sugar per acre.

232. NORRIS, R. V.

633.72

Notes on the work of the Scientific Staff.*Tea Quarterly*, 1932, 5 : 156-60.

A note on some of the work of the past year at the Tea Research Institute, Ceylon. "Yellows" disease of tea in Nyasaland caused by a deficiency of sulphur resembles "Witches Broom" disease in Ceylon. Manurial experiments have been laid down in which infected bushes are treated with manure containing sulphur, the control receiving similar treatment without sulphur. Conclusions cannot yet be drawn. An examination into the number and nature of organisms brought into the factory on fresh leaves is of interest in view of the theory that the changes during manufacture are caused by micro-organisms. It was found that the number of organisms enormously decreased during the various stages of manufacture, far fewer organisms being found in the fermented tea just before firing than on the freshly withered leaf. It is considered that this strongly supports the view that tea fermentation is not due to the activity of micro-organisms. An experiment has been started to determine the effect of chemical composition on the dieback or growth of pruned branches. From the manurial experiments comparisons between three forms of nitrogen, namely blood meal, cyanamide and ammonium sulphate, will shortly be available. From the point of view of estate economics this information will be of interest. In the cover crop experiments *Parochaetus communis* has proved the most promising. Experiments in manufacture are also referred to.

233. MILSUM, J. N., AND MARSH, T. D.

633.72(595)

Lowland tea in Malaya.*Malayan Agr. J.*, 1933, 21 : 147-63, bibl. 5.

This paper records the results obtained with the cultivation and manufacture under lowland conditions at the Government Experiment Station, Serdang. General principles of tea cultivation and manufacture are not dealt with. The climatic conditions are wet seasons during March, April and part of May, and in October to December, the other months being mainly dry. The flush is vigorous throughout the year and requires a 7-day picking round. The soils are dark sandy to yellowish clay loam of the quartzite type. Under local conditions, shade and a free rooting medium have been found essential to the success of the tea seedlings. (Recently etiolated shoots have been found to root readily but have not been tried in the field.) In transplanting, good-sized stumps up to 2 years old devoid of soil have been found to transplant better than younger seedlings even with a ball of earth on their roots. The most successful shade tree is *Albizia moluccana*. This has a light foliage and will grow 50 feet in 3 years. The claims of other shade trees are discussed. The intensive use of the tall leguminous cover crop, *Crotalaria anagyroides*, has proved very successful with young tea as an auxiliary shade, and as a means of maintaining a cool soil and preventing erosion. The most effective measures against erosion were found to be moderately undulating land, a series of contour silt pits 30 feet long, 2 feet deep and 2 feet wide with stops 2 feet wide between the ends of the pits. The distance between each row of pits is half a chain. The bank of the pit is closely planted with root cuttings of Vetiver grass (*Vetiveria odorata*). The leguminous plants *Crotalaria anagyroides* and *Chitoria cajanifolia* have also been used here with success. Manurial experiments are in progress. The most satisfactory time for pruning at Serdang has been found to be October. In plucking two leaves and a bud only are plucked. The paper concludes with a description of manufacture and reports on samples submitted to London and Colombo.

234. TUBBS, F. R.

633.72-1.534/535

A note on the vegetative propagation of tea.*Tea Quarterly*, 1932, 5 : 154-6, bibl. 2.

A method of layering in Formosa is described. The ground round the bush is ploughed up, the lower branches are bent down and sharply twisted near their origin, pegged down and buried, the upper part being left above the soil. The plants so formed are rooted and ready for removal within 6 months. The "China jat" type bush roots more readily than the "Assam jat".

Propagation by hardwood cuttings is successful only to the extent of about 5%. Softwood cuttings rooted by Tunstall* in a glass propagator obtained 53% success in 6 months. Splitting a young seedling down the centre in such a way that one cotyledon remains attached to each section will result in the eventual formation of two normal identical plants. If more than two are required from the seedling the division must be made before the radicle is 5 millimetres long. A larger number of identical plants can be obtained by cutting back 9-12 month old seedlings to 1 inch of stem and dividing into 4 or more fragments. It is necessary to maintain the fragments in a saturated atmosphere. The rooting medium is washed sand.

235. STOREY, H. H., AND LEACH, R. 633.72-1.811.7

A sulphur-deficiency disease of the tea bush.

Ann. Appl. Biol., 1933, 20 : 23-56, bibl. 27.

The authors produce evidence that the "yellows" disease is the result of the deficiency of sulphur in the bush, relative to other elements. The disease was prevented or cured in field experiments by treating the soil with (a) mixed fertilizers including sulphates, (b) the sulphates of ammonium, potassium, sodium or magnesium, (c) elemental sulphur.

236. SMEE, C. AND LEACH, R. 633.72-2.75

Mosquito bug the cause of stem canker of tea.

Nyasaland Protectorate Dept. Agr. bull. 5 (N.S.), 1932, pp. 8.

A cankerous growth in the woody stems of young tea bushes, particularly in nurseries, leading to die-back of shoots, is shown not to be due to a fungus, as was once thought, but to the feeding action of the tea mosquito bug, *Helopeltis bergrothi* Reut., on the green shoots. The damage to the tea flush caused by this insect is well known; that it is also the cause of gnarled stem canker of tea has not, it is claimed, hitherto been recognized. A canker does not result from a puncture by the insect if the feeding is on the flexible part of the shoot below the flush, or on older green shoots, if penetration is deeper than normal, i.e. below the pericycle. If, however, the contents of the intermediate tissues (pericycle) on the older green shoots are tapped, a canker invariably results, the final development of which may not occur for a month or more. If a canker is to be found, its incidence can be diagnosed at once, even while the insect is still sucking, by a very faint water-soaked mark or brown streak which appears on the green part of the shoot. The further development of the injury is described in detail. It follows that the elimination of gnarled stem canker of tea depends on the control of the tea mosquito bug. The method advised for Nyasaland is the employment of collecting gangs of children from early in the season. A start should be made early in the morning when the insects are easily seen feeding on the upper parts of the plants. Pale green feeding marks on the foliage are of recent origin and indicate that the insect is close at hand.

237. SANDERS, F. R., AND WAKEFIELD, A. J. 633.73(67.82)

Coffee cultivation. Some factors in arabica coffee growing with especial reference to the Northern Province Tanganyika Territory.

Tanganyika Territory Dept. Agr. pamphlet, 7, 1932, pp. 14.

The problem discussed here is that of maintaining a balanced C/N ratio in coffee plantations under Northern Province conditions in Tanganyika, where nitrogen is the limiting factor. The reduction of carbohydrate formation to the low nitrogen level by such methods as shading, while preventing the prevalent overbearing and consequent biennial cropping, would result in a minimum of food elaboration and a subsequent poor crop. It is suggested that the effect of the application of nitrogenous manures is strictly correlated to the time of application. Applied at bud formation it will result in a production of vegetative buds and a reduction of crop in the following year; applied near the time of flowering it may restrict the crop in the year of

* Tunstall, A. C., "A note on the propagation of tea by green shoot cuttings." *India Tea Assoc. Quarterly J.*, 1931, pp. 49-51.

application; applied after fruit setting it will encourage leafage and consequently a greater assimilation of carbohydrates; thus the application of nitrogenous manures may be so timed as to offer a means of control of biennial cropping. It is considered that with regular bearing coffee the time of application of nitrogenous manures should be at least four months before the flower buds are normally visible, but in the case of coffee showing biennial bearing a heavy dressing of nitrogen should not be given until two months later, the aim being to limit flower bud formation, and thus prevent overbearing and biennial cropping.

238. SANDERS, F. R., AND WAKEFIELD, A. J.

633.73:581.144.2

Further observations on factors in arabica coffee culture.

Tanganyika Territory Dept. Agr. pamphlet 8, 1932, pp. 27.

The root system of coffee is described and illustrated. The best local coffee soil is a red volcanic, well aerated, with good nitrate content and containing, besides the usual mineral salts, 50-60% of clay. A foot lower, with a marked pan at its junction, is an unaerated subsoil containing such mineral salts as potash, phosphates, lime, sulphur, magnesia, etc. The root system of the coffee consists of:—(1) An upper layer of laterals running parallel to the surface, extending to a radius of 7 feet in a 4-year-old tree and plentifully endowed with fibrous rootlets. This section operates only in the aerated top soil, which has high nitrogen content. It is noticeable that while the feeding roots of these laterals point both upwards and downwards at a medium depth, those on laterals running lower than 1 ft. only point upwards. (2) The second type of root is made up of laterals growing downwards into the unaerated subsoil which has a low nitrate content. It is thought that these roots are concerned with the supply of water and mineral salts and that the feeding rootlets they bear do not require an aerated soil for development. The development of the feeding rootlets in the soil surface proceeds in waves of growth and rest, which appear to coincide with the periodic rise and fall of the nitrate content of the soil, which in turn corresponds with the rainy seasons, i.e. in the rainy season nitrification is low or absent owing to the water-logging of the soil. In districts where the soil is deep, sandy and porous, and the rainfall high, nitrates are washed away before the roots have time to absorb them, and on these soils coffee will not succeed. Tea, on the other hand, with its deep root system, does well on these lands. At present, therefore, the limiting factor in coffee soils is the effect of rainfall on the soil nitrates. It is pointed out that this range could be extended by the production of a deeper rooting root-stock compatible with an arabica scion. Comparison is made with local conditions and those pertaining in temperate countries. It is shown that whereas in temperate climates the manufacture of carbohydrates is low and nitrates are plentiful, often necessitating some artificial restriction on their absorption, the reverse is the case under the strong sunlight of Tanganyika. Growers are warned that anything which will tend to diminish the power of the tree to absorb nitrogen, such as root pruning, damage to roots by cultivation, or the erosion of the nitrate-holding surface soil, must be avoided. A warning is given against deep planting which is particularly detrimental to the coffee tree.

239. COLEMAN, L. C. (EDITOR).

633.73(54.8)

Report of work on the coffee experiment station Balehonnur, for the years 1930 and 1931.

Mysore Coffee Exp. Sta. bull. 8, 1932, pp. 31.

The results of manurial experiments over five seasons are described. Significant differences between various treatments were not obtained. The reasons are discussed. The technique employed in the study now proceeding of the reaction of coffee to the pH concentration of the soil is described. The plants under treatment are in cement cisterns 6 × 6 × 1½ ft. filled with a uniform soil mixture to which acid and alkali are added at regular intervals to bring about the desired reaction 4.5-8.0 pH. In root rot investigation infection was traced back to the decaying stump of a shade tree. No practical remedy has been found. A report is made on a series of fungicides and adhesives, details of which are given in an appendix. In plant breeding and selection a number of hybrids are already available. The artificially pollinated flowers are

covered with wide muslin bags supported inside bamboo rings. Paper bags first tried damaged the shoots and leaves through lack of aeration. To emasculate the flowers a satisfactory method is to remove the corolla tube in the unopened stages with the attached anthers, leaving the stigma behind. Selected arabicas such as Kent and Coorg strains are being pollinated with robusta, and the F_1 seedlings have been planted into their permanent positions. When the reverse cross is made with robusta as the mother plant there is a failure to set seed. Robusta is proving a capable rootstock for arabica. A hybrid arabica, Netrakonda, which is characterized by a remarkably vigorous growth, is to be tried as a rootstock. The most satisfactory grafting method is the wedge graft with a twine binding. The grafts have to be covered to protect them from heat and direct sunlight. Trials with tubes of glass or xylonite as covers failed, but cylinders of newspaper impregnated with paraffin wax have proved most successful.

240. JAMES, H. C. 633.73-2.752
The control of *Asterolecanium* (The Fringed Scale of coffee).
Kenya Dept. Agr. bull. 23 of 1932, pp. 4.

The principal method recommended is to spray with Orthol K at a strength neither greater than 1 in 25 nor less than 1 in 33. Two applications should be given within from a fortnight to six weeks of each other. The best results are obtained if the operation is performed towards the end of the rainy season, when reproductive activity is at its highest.

241. NOTLEY, F. B. 633.73-2.754
The control of *Antestia* in wetter districts.
Kenya Dept. Agr. bull. 4 of 1933, pp. 12.

Notes on a paraffin-pyrethrum-soap emulsion spray for the control of the coffee bug, *Antestia faceta* Germ.

The following also is noted :

- JAMES, H. C. **Banding for coffee mealy bug control.** *Kenya Dept. Agr. bull.*
 24 of 1932, pp. 6.

242. O'CONNOR, R. 633.81-1.534.4
Tonca beans. A method of vegetative propagation.
Agricultural Notes (Trinidad), 1932, 3 : 119.

This tree has been successfully propagated by marcotting at the Department of Agriculture's River Estate, Trinidad. Limbs $\frac{3}{4}$ inch in circumference were used. The bark was removed over a surface of 2-2½ inches. The covering material was a thick padding of wet moss, bound on with soft string. Rooting began in some cases within 10 weeks. [We understand that some success has also been achieved with patch budding in Trinidad.—ED.]

243. HOLLAND, T. H. 633.85
The croton oil tree.
Trop. Agriculturist, 1933, 80 : 13-7.

An account of the cultivation of *Croton Tiglium* under Ceylon conditions. The plant is usually raised from seed sown at stake, planting distance about 12 ft. by 12 ft. Shade is unnecessary, though at Paradeniya a row of shaded trees appears the more healthy. Pollarded trees have been found to yield better besides being easier of access than trees allowed to grow naturally, and the operation is recommended. A crop may be expected two years after planting. Trials on land previously occupied by rubber or coconut have not been successful. The seeds are sent to Europe and the oil extracted there. The commercial prospects are only moderate. A recent shortage led to a sudden steep rise in price with the result that the tree has been largely planted. Prices are now returning to normal.

244. OSTENDORF, F. W. 633.912-1.541.5
De groei van jonge Hevea-oculaties. (The growth of young *Hevea* buddings.)
 [English summary.]
 H. Veenman and Zonen, Wageningen, 1933, pp. 96, bibl. 31.

The paper is mainly concerned with problems connected with the selection of *Hevea* buddings for vigour of growth. Some light is thrown on problems of budding technique. A series of experiments, which are described, was arranged in the Experimental Garden Tjiomas in Java. The following are some of the conclusions arrived at. The length of the period which elapses between the date of transplanting or cutting back of a budded stump and the date when the swelling bud breaks through the cortex is a specific clonal property varying with the clone. This period is called here the *sprouting period*. The girth of the rootstock has no influence on the sprouting period. The first direction of growth of the young bud on the rootstock is not the same for all clones and hence may be used as a character for identification. The duration of resting periods of growth and the length between the leaf storeys is a clonal specific character. Buds of clones with short resting periods give the best "takes". A distinct positive correlation exists between the length of storey and the number of leaves; a smaller correlation between length of storey and leaf size; a doubtful negative correlation between number of leaves and leaf size. The number of bud scales showed a positive correlation with the duration of the resting period. Damage to the root system had little effect on growth periods but the resting periods were lengthened in proportion to the amount of root damage. The degree of relationship between stock and scion had no effect on growth of scion except in one experiment and here it quickly passed off. The strongest buds show the shortest sprouting periods and subsequently the shortest resting periods, a fact to note when experiments on the length of sprouting periods are planned. An attempt is made to explain these conclusions from a physiological standpoint.

245. HOOP, D. J. N. v. D., AND OSTENDORF, F. W. 633.912-1.541.11/12
Over den wederzijdschen invloed van boven-en onderstam bij Hevea-oculaties.
 (On the mutual influence of stock and scion in *Hevea* buddings.) [English
 summary.]
Archief v. d. Rubbercultuur, 1932, 16 : 392-409, bibl. 8.

Rootstocks planted in 1919-20 were budded at one metre in 1923 with 24 clones of which 19 are used for the purposes of this discussion. The number of trees for each clone vary from 10 to 32. Girth measurements were made and bark samples taken 20 cm. above and below the union, and the trees were tapped over a period from October 1930 to 1931, again above and below the union. The data were subjected to statistical analysis and the following conclusions formed :—
 (a) The rate of girth increase of the stock was greatly influenced by that of the scion; the influence of stock on scion in this respect was marked but of less importance. (b) The number of latex vessels in the stock is independent of that in the scion, but is related to the growth rate of the scion. Generally the number of latex vessels in the scion is not dependent on any stock characteristic. (c) The productivity of both stock and scion is in both cases largely determined by influences emanating from the crown of the tree and travelling downwards across the union. Yield and number of latex vessels in the stock do not affect the yield of the scion, but growth rate of stock has some small influence.

The authors offer the practical advice that, where high budding is practised and both scion and stock are to be tapped, high yielding vigorous clones are of the first importance as scions. For ordinary budding work, where the scion only is tapped, the use of high yielding stocks (i.e. seedlings from mother tree seed) was no advantage; but stocks from quick growing trees are to be recommended, with the added advantages of a more successful budding and earlier maturity.

T.N.H.

246. OPSOMER, J. E. 634.6(921)
Notes sur l'élaeis à la côte est de Sumatra. (Notes on the oil palm on the east coast of Sumatra.)

Bulletin Agricole du Congo Belge, 1932, 23 : 422-71, bibl. 25.

This is a long and very complete account of the cultivation of the oil palm in Sumatra. The palm is fairly accommodating as to soil but develops best on deep, flat alluvial, sandy loam or volcanic soils having a high pH content. Perfect drainage is essential. The optimum climatic conditions are abundant rainfall (by night if possible), a high light intensity and a mean temperature of 24-26° C. The palm fruits best with an average humidity of 50-70%. It resents dry winds, but, its pollen being wind borne, air movement is necessary for its effective pollination. Propagation is effected by sowing selected seed in the open without shade, in specially prepared soil. Germination is slow when the seed is not fresh and it is customary to stimulate it in various ways. (1) Soaking in water for a period of 6 or 7 days. The temperature of the water when the nuts are first put in is 45-50° C, it is subsequently allowed to cool naturally. This system gives a 50% germination in 3 months and 80% in 6 months. (2) Soaking in a 1% solution of hydrochloric acid for 2 days, followed by a 3-days' rinsing in running water. This gives 85% germination in 9 months. It is said, however, that seeds sown the same day as gathered will give equally good results. The seedlings are transplanted into nurseries (situated on the plantations to reduce transport) where, spaced 18 inches apart, they are kept for a year. In the plantation the planting distance is about 30 feet. Various leguminous cover crops are used. The trees are regularly manured with organic manure. Chemical manuring is still in the experimental stage. The local pests and diseases are briefly mentioned and there is a chapter on the manufacture of the oil. Research is proceeding in the following directions:—Improvement of varieties by cross pollination and selection. The pollen is collected, dried and distributed over the female flowers with a glass and rubber dusting apparatus. It can be preserved dry in good condition for 9 weeks. Artificial pollination as a cultural practice has been provisionally abandoned. In the first year it will give an increase of 80%, but the second year only 20%. The trees, moreover, are thought to suffer, there is an excessive fruit drop, and the size of the fruits is said to diminish. It is thought, however, that some modified system of artificial pollination in conjunction with manuring for instance, on rich ground only, or at certain times of year, might prove advantageous and experiments are in progress. Experiments on the hastening of germination and manurial trials are also being carried out, most of them as in this case being undertaken by the Algemeen Proefstation der Algemeene Vereeniging Van Rubberplanters der Oostkust van Sumatra (usually known as A.V.R.O.S.).

247. MCGREGOR, G. M. 634.6
The vegetable ivory palm (*Hyphoene ventricosa*).
S. Rhodesia Ministry of Agriculture, bull. 888, 1933, pp. 4. Reprinted from *Rhodesian Agr. J.*, 1933, 30 : 289-91.

The main habitat of this palm is the Ngami Flats of the Wankie district, though it is found in other parts of Rhodesia. The soil is shallow and badly drained, the ground being covered with depressions and small mounds. It is on the slopes of both of these that the ivory palm is found. The palms are dioecious. The fruits are borne on spadices of which there are usually 5 per tree arising from the axils of the lower leaves, the average number of fruits being 450 per tree. The fruit is the size of a tennis ball and has a spongy casing which is eaten by natives. Within this is an extremely tough covering of fibrous texture, hard and difficult to open. This contains the ivory or seed. The ivory is soft in the green fruit but hardens on opening. It is hollow and contains a milk similar to coconut milk. It is like an onion in shape and about 1½ inches in diameter. If cut across, about ¼ inch thickness of endosperm or solid "ivory" is revealed. It is estimated that under the local conditions about 180,000 fruits per square mile could be obtained or a weight of ivory of 8,000 lbs. Its present use is mainly for curio carving, but the author is of opinion that it forms a promising substitute for animal ivory or bone for the manufacture of small articles, or even as a substitute for copra.

248. FERNANDO, SIR H. M. 634.61(548)
The present position of coconut cultivation as an agricultural asset of Ceylon and the extent to which it may be advanced through the growing of bye-products side by side of the main industry.
Trop. Agriculturist, 1932, 79 : 339-48.

The policy outlined is to grow pasturage for cattle between the palms. The land is ploughed and manured once in two years, a different quarter of the estate being dealt with every half year. The manure consists of 3 cwt. of slaked lime and 3 cwt. of basic slag or Ephos-phosphates. Forty pounds of green manure per tree are added, obtained from the perennial leguminous trees *Gliricidia* and *Leucaena (glauca)* which are grown on the borders of the estate and of its roads. The pasture grass is grown between the trees. It yields a fodder of high nitrogen content and at least 75% of it is returned to the soil after passing through the animal. The author claims that this treatment has enabled coconut estates to carry two head of cattle per acre where previously one head every two acres was the utmost that could be maintained, and in addition it has largely improved the bearing capacity of the trees. He asserts that planters who do not make use of this method are letting pass a source of considerable profit.

249. WERNIGG, A. TH. 634.61(59)
The coconut industry in the Andaman Islands.
Tropical Agriculturist, 1932, 79 : 349-52.

This article sets out the possibilities of profitable coconut growing in the Andaman Islands. The land available, a rich fertile clayey loam, somewhat deficient in phosphoric acid, is situated on hill sides at an average altitude of 250 feet and is thus provided with a natural drainage. There is a local absence of those major pests, the coconut beetle (*Oryctes rhinoceros*) and red weevil (*Rhynchophorus ferrugineus*), nor is there any serious fungoid disease. Troublesome weeds are also completely absent. The climate is normal for tropical islands, warm but tempered by sea and land breezes, while most of the malarial swamps have been filled in. The proximity of Burma provides a certain market for whole nuts, shipped without the husk at remunerative prices. There will be no need to manufacture copra for many years. The Government are prepared to grant favourable terms to prospective growers if backed by the necessary capital. The terms of the grant are said to be 4 annas per acre for the first 12 years and Rs. 3 for the next 18 years. On renewal of lease the revenue assessment shall not be liable to enhancement by more than 100% of the last assessment. Labour is mainly Tamil and Telugu imported from Madras. The labourers are skilled climbers and huskers. At present their pay is 10 annas per diem with free accommodation and medical attendance.

250. COOKE, F. C., AND JAGOE, R. B. 634.61(595)
Further observations on the dwarf coconut palm in Malaya.
Malayan Agr. J., 1933, 21 : 164-71, bibl. 2.

The paper summarizes the merits and demerits of the dwarf coconut palm in Malaya from information obtained from the Government Coconut Experiment Station at Klang and from estate plantings. It is found that, given suitable conditions, the dwarf coconut will give remarkable yields. The palm's requirements, however, are so exacting that the yields are more often than not disappointing. The correct environment seems to be a very heavy but well drained clay soil with a water-table at about 2½ feet (as opposed to 3½ feet, the optimum for the tall palms). The palms benefit greatly by irrigation provided that there is a perfect water movement through the soil. The copra from dwarf palms is inferior to that from ordinary palms. Of the yellow, red and green varieties of dwarf coconut palm the best copra is obtainable from the green variety.

251. SHARPLES, A. 632.142 : 634.61 + 633.912
Lightning storms and their significance in relation to diseases of (1) *Cocos nucifera* and (2) *Hevea brasiliensis*.
Ann. Appl. Biol., 1933, 20 : 1-22, bibl. 16.

When the work described in this article started, available literature pointed to the likelihood that an association of a *Phytophthora* sp. with the common "bud rot" symptoms of palms would be found. No such evidence was obtained and the investigation proved that lightning was a factor of the first importance in the causation of disease on coconut plantations in Malaya and was directly or by its after-effects responsible for "bud rot" symptoms. Lightning was also proved to be of some importance in causing disease on rubber plantations. The typical effects on rubber plantations are described.

252. AVIS, H. W. 634.65/66
Shea nuts.
Food Manufacture, 1933, 8 : 95-7.

The purpose of the article is to call attention to that somewhat neglected product, the Shea Nut. This, the fruit of *Butyrospermum Parkii*, is grown on the Gold Coast and in Nigeria, but is exported mainly from Nigeria, 7,433 tons of nuts valued at £45,619 being exported thence to Belgium and Holland in 1931. The fruit consists of an apple-green skin enclosing a soft fleshy layer which in turn contains the kernels. To extract the kernels for sun-drying the fruit is first boiled to remove the mesocarp and then spread in the sun for ten days to dry. After 10 days the nuts are cracked between two stones, winnowed, and again sun-dried for 10 days, by which time the moisture will have fallen from 40% to 7%. If kiln dried, the nuts are heated in a mud kiln for 5 days, the temperature not exceeding 90° C. at the top and 60° C. at the bottom. Nuts can arrive in Europe with a free fatty acid content of less than 6% and an oil content of over 46%. The product as manufactured in Europe is a whitish, stiff, plastic fat, melting between 23° C. and 25° C. It can be separated into stearine and oleine. The supposed difficulty in refining this fat can be eliminated according to de Belsunce (*Bull. Matières Grasses*, 1926, Nos. 7 and 8 ; 1927, No. 1) by the following method. First the oil is steamed to remove the odour. Then it is treated with a solution of sodium carbonate and thereafter, when the soap stock has been removed, in the usual manner, being in this method finally bleached with persulphate. Properly refined shea butter will not easily go rancid. The cake after removal of the oil is high in carbohydrates and low in proteins, making a useful adjunct in a compound cattle-feeding cake. In one way or another the entire nut can be utilized.

253. HOFMEYR, J. D. J. 634.651
Papaw selection.
Farming in South Africa, 1933, 8 : 157-8, bibl. 3.

Selection of papaws (*Carica papaya* L.) was started at Nelspruit Subtropical Horticultural Research Station, South Africa, in 1931. The chief points in the selection programme are (a) keeping and shipping quality ; (b) suitable shape and size for packing ; (c) colour ; (d) eating quality ; (e) thickness of flesh ; (f) length of fruit stalk, a long stalk being useful to prevent damage from overcrowding ; (g) disease resistance ; (h) yield and vigour. In the course of the investigations several beliefs commonly held by growers have been disproved. It has been found, for instance, that the strain can definitely be improved by selection in spite of the plant being dioecious, particularly if selections are made from the centre of the plantation, when there are neighbouring groves. Again, it was found that no ground exists for the assumption that the male trees are the more vigorous ; hence the elimination of the more vigorous seedlings when transplanting in the hope of destroying the males is merely a destruction of the best plants ; vigorous trees produce fruit early, for a longer period and lower on the stem, all of which are desirable characteristics. The belief that the males comprise at least 70% of the population was also proved incorrect, investigations showing that distribution was about equal. Pollination experiments showed the necessity, moreover, for the presence of male trees, contrary to popular

opinion. Arising from the percentage distribution of the sexes farmers are advised to plant 4 seedlings in a planting hole instead of the usual 2. If this is done, the chances that one at least will be a female when the sexes are determined and the plants thinned to one per hole are then $93\frac{3}{4}\%$ and the chances that 2 will be females, thus allowing the strongest to be retained and greater uniformity obtained, are $68\frac{3}{4}\%$. By this method, too, since mortality among transplanted seedlings is high, the cost of replacement is also reduced, the number needed being reduced to a minimum. In a perfect stand, by thinning to one per hole and leaving a female wherever possible, sufficient males will be left for effective pollination. The theoretical expectancy has been verified in the field. Before storing, the seed should be washed in several changes of water and spread thinly to dry. It will then retain its germinating power for a year. Fermentation of the seed as advised by some growers was found definitely to reduce the germinating power.

254. CHEESMAN, E. E.

634.771/2 : 576.3 : 575.1

Genetic and cytological studies of Musa.

Memoirs of Imperial Coll. Trop. Agr., botanical series 2. Reprinted from *J. Genetics*, 1932, 26 : 291-316, bibl. 16.

I. *Certain hybrids of the Gros Michel banana.* (1) Artificial pollination of the sterile and parthenocarpic Gros Michel banana (somatic chromosome number 33) by a fertile *Musa*, identified as a variety of *M. malaccensis* Ridl. (somatic chromosome number 22), results in formation of occasional seeds, the average seed production being less than 1 per 100 flowers. (2) Of ten plants raised from such seeds and examined cytologically, eight have 44 somatic chromosomes and two about 75. The former resemble their female parent, and have parthenocarpic fruits but an increased pollen fertility; the latter are thick-leaved, dwarf, and apparently sterile. (3) Of five plants, forming an F_2 generation from one of the 44 chromosome F_1 individuals, three have 44 somatic chromosomes and two have 46. (4) The F_1 crosses back to its female parent only with extreme difficulty, but crosses readily with its male parent, giving vigorous progeny with 33 somatic chromosomes. (5) The course of events suggests that the basic haploid chromosome number in this series is 11. The meiotic phenomena are not inconsistent with that hypothesis, but they further suggest that the 11 is a secondary haploid number, possibly derived from an original 8. II. *Hybrids of Mysore banana.* (1) The Mysore banana seeds more readily than Gros Michel when pollinated by *M. malaccensis*, but its behaviour is otherwise similar. (2) Of nine hybrids raised and studied, six have 44 somatic chromosomes and resemble their female parent in vegetative habit, two are thick-leaved dwarfs comparable both in habit and in chromosome number with similar types raised from Gros Michel, and one with 33 somatic chromosomes is intermediate in vegetative characters between its parents. (3) Pollinated by the tetraploid Gros Michel seedling I.C. 1, Mysore gave two hybrids, of which one has approximately 55 chromosomes in its somatic cells, and the other approximately 90. Both are thick-leaved, and the latter is also dwarf and almost certainly sterile. [Author's summary.]

255. BONACELLI, B.

634.771/2

La diffusione del banano. (**The spread of the banana.**)

L'Agricoltura Coloniale, 27 : 170-80.

This account, which would be of even greater value were a bibliography included, is nevertheless a most readable history of the spread of the banana from earliest days, of the different types and the different uses made of it for food, for alcohol, for fibre. The author does not state that the banana actually originated in Malay, but he considers that its earliest diffusion to different parts of the tropics started from the Malayan Archipelago.

256. SIMMONDS, J. H.

632.48 : 634.771/2

Banana leaf spot.

Queensland Agr. J., 1933, 39 : 21-40, bibl. 7.

A progress report of the investigations which were begun in 1928. Experimental methods of control were :—(a) Dusting with copper sulphate-lime and at a later date with copper carbonate-

kaolin, and stripping all spotted leaves, dusting and stripping being each carried out a number of times. No appreciable control was obtained. (b) Stripping. Rigorous removal of all spots in their pre-fruitlet stage. The meagre results did not justify the expenditure. (c) Cover cropping failed owing to abnormal drought. (d) Fungicidal treatment of suckers. The suckers were steeped before planting in a solution of mercuric chloride or of copper sulphate; various strengths of solution and lengths of time for the steeping were tried all without significant effect. (e) Spacing at a minimum interval of 6×6 ft. to a maximum of 15×15 ft. disclosed no significant difference. After a discussion of the field experiments an account follows of the laboratory work. Leaf diseases other than leaf spot are also briefly dealt with. It is stated in conclusion that while definite control has not been obtained the ground has been cleared for future work. Owing to the nature of the banana two important avenues of control appear to be closed. A resistant variety is not apparently available and the use of fungicides is unsatisfactory and often impracticable. The author considers the vital time for attacking the disease to be in the late summer months and he thinks it possible that some system of strict sanitation during the early part of the year might be of definite benefit.

257. EDITORIAL.

632.48 : 634.771/2

Panama disease.*J. Jamaica Agr. Soc.*, 1933, 37 : 138-9.

A short extract of a speech made recently by the Governor of Jamaica in which is reviewed the present situation as regards Panama disease of banana in Jamaica. The annual percentage of increase in the number of cases treated has shown a steady decline; the figure, however, represents a loss of 1,700 acres of bananas in quarantine in 1932, apart from such land as may have been totally abandoned on account of the disease. It is the considered opinion of the Department of Agriculture that the planting of new lands and the development of irrigation can do no more than counterbalance the acreage annually abandoned. While no attempt is made to forecast the date when the Gros Michel banana plantations will be finally destroyed, it is emphasized that hope for the future of the industry lies in the production of an immune variety which also fulfils market requirements. The recent appointment of a geneticist to the Department of Agriculture will, it is hoped, hasten this work, but owing to the sterility of the banana, hundreds of thousands of pollinations produce only a few seedlings and results must necessarily be slow. Reliable data on the commercial value of existing hybrids has so far not been obtained, as the fruit was required for pollination purposes. However, a sufficient stock now exists of presumably immune hybrids for the making of an adequate commercial scale test in 1933-4.

258. SMITH, F. E. V.

632.48 : 634.771/2

Panama disease in Jamaica.*Jamaica Dept. Sci. and Agr. microbiological bull.* 1, 1932, pp. 22, bibl. 20.

The writer of this bulletin shows that in the past twenty years 15,660 acres of banana land have been put out of cultivation in Jamaica owing to Panama disease. He considers that while the present heavy export of bananas will continue for a time, within ten years a serious situation will have arisen. The various methods of combating the disease are surveyed and the conclusion is drawn that while these may check the disease to a certain extent the only hope lies in the production of a resistant variety. To this end all forces should be concentrated on the resistant seedlings now under trial by the Department of Agriculture. Extensive trials under a variety of conditions to test the results of ratooning on the development of additional weight of the bunch are very necessary and it is hoped sufficient material will soon be available. Trials to test shipping qualities will also have to be made. It is urged that a subsidiary crop should be added to banana plantations so that attacks of Panama disease should not leave the planter destitute, citrus being suggested as being the most profitable. The financing of a scheme to supply good quality budded plants to growers is discussed. In this connection it is suggested that since over £5,000 per annum is paid out to banana growers as compensation for healthy plants destroyed in carrying out the quarantine measure (whereby the eight plants surrounding

a diseased plant are destroyed), one half of the payment should be appropriated for the development of citrus nurseries, from which the grower would receive the balance of the compensation in the form of budded citrus plants provided and planted for him gratuitously by the assistants of the Disease Inspectors in the quarantine areas.

259. LEVIE, E. L. 634.774 : 382.6
De export van ananas naar Europa. (**Export of pineapples to Europe.**)
Economisch Weekblad voor Ned. Ind., 1933, 1 : 1312, reprint from *Mededeeling v. d. Tuinbouwkundigen Dienst der Afdeeling Landbouw*, pp. 8.

This article points out that there should be a considerable market for Dutch East Indian pineapples in Europe, and particularly in Holland, this country depending at present on fruit from the Azores and the Cape. Dutch East Indian pineapples are produced in great quantities, supplies are always available and the local variety Bogor fulfils the market requirements for imported fruit. Instructions are given for the best methods of packing according to South African usage. The fruit must be sent when just yellow. Fully ripe fruit turns brown on the journey and is not liked on the market. Fruit unripe when sent fails to ripen on arrival. The proper temperature of storage on the journey is 8-10° C. Fruit half green and half yellow can be rendered more saleable if the storage temperature on the voyage is raised to 12°C. Too low a storage temperature gives the fruit an ugly dull brownish appearance, with spotted flesh, while mildew develops freely, and the fruit quickly rots when exposed to room-temperature. Too high a storage temperature turns the fruit brown and causes it to rot.

260. DA SILVEIRA, J. C. 667.211.4
Contribution analytique à l'étude chimique des écorces de palétuviers des colonies portugaises. (**Analytical study of the chemistry of mangrove bark in Portuguese colonies.**)

Anais do Instituto Superior de Agronomia, Portugal, 1932, 5 : 25-138, bibl. 16.

This article, which is written in French, is concerned with the commercial possibilities of the bark of various species of mangrove. The bark is used in the tanning industry, but the fact that it colours the skins a greyish-mauve or deep red prevents it from fetching a good price in competition with other tanning materials, and in England and France it is unsaleable for this reason. The author thinks that the chief development in the use of mangrove bark in tanning lies in the fact that it can be used in tanning mixtures, particularly those made of colourless substances, on account of its low price where it would not be possible to use it pure. A useful feature is a detailed analysis of the bark of a number of mangrove varieties from various localities.

STORAGE.

261. SMITH, W. H. 664.85.11 : 581.113
Evaporation of water from apples in relation to temperature and atmospheric humidity.

Ann. Appl. Biol., 1933, 20 : 220-35, bibl. 8.

The author describes his technique for determining by a weighing method the rate of evaporation of water from certain isolated plant organs, under conditions of constant temperatures and constant atmospheric humidity. Bramley's Seedling and Cox's Orange Pippin apples and Beurré Clairgeau pears formed the material for the study. The rate of evaporation of a Bramley's Seedling apple under the above conditions decreased at first rapidly and then more slowly to a more or less steady state. The rate of evaporation increased with decreasing relative humidity down to about 65 relative humidity, a gradual decline in the rate of increase being shown for each decrease of humidity. Relative humidity being constant and temperatures

between the limits of 3° and 15° C. the rate of evaporation is more nearly approximate to the vapour-pressure deficit of the external atmosphere. The variation in evaporation rate between individual apples of the same variety under the same conditions of temperature and humidity is considerable. These cannot be attributed to differences in the thickness of the cuticles.

262. FRIEND, W. H., AND BACH, W. J. 664.85.3(76.4)

Storage experiments with Texas citrus fruit.

Texas Agr. Exp. Sta. bull. 446, 1932, pp. 40, bibl. 10.

During 1930-31 experiments were initiated to determine the most favourable conditions for holding Texas citrus fruit (grapefruit and Valencia orange) in cold storage. The principal causes of loss in cold storage are pitting, scald and stem end rot, blue mould, blossom end rot and bruising being of less importance. Pitting and scald, being due to physiological breakdown, present the biggest problem. In the longer periods of storage a temperature of 44-45° F. gave the best results. The loss from scald was greatest at 31-32° F. A temperature of 36-37° F. proved unsatisfactory. Age or ripeness of fruit appear to exercise less influence on the keeping quality than do climatic conditions during maturation, particularly rain. Fruit wrapped in waxed paper and held at 70° F. for ten days previous to cold storage had a more prolonged life in cold store. In all cases grapefruit in waxed wraps held up better and was firmer than fruit in ordinary grapefruit paper. Differences in keeping quality of varieties were as follows:—Duncan grapefruit retained its original flavour much better than Marsh Seedless and was less susceptible to physiological breakdown. Valencia oranges retained their freshness and were not seriously affected by breakdown. Grapefruit from trees treated with fertilizers containing a high percentage of potash suffered more from scald while in cold storage than did fruit from unmanured trees. The keeping quality of Valencia oranges was unaffected. The source of the fruit appeared to have a marked influence on the development of disease, fruit from one district regularly keeping better than fruit from another, as also fruit from particular growers in the same district.

263. CRANE, M. B., AND ZILVA, S. S. 634.11 : 577.16

The antiscorbutic potency of apples. V.

Biochemical J., 1932, 26 : 2177-81.

Preliminary experiments [*J. Pom. Hort. Sci.*, 1931, 9 : 228, *H.A.*, 1931, 1 : 4 : 413] have indicated that triploid apples tend to have a higher vitamin C content than diploids. The present paper deals with tests carried out on a further number of triploid varieties mostly from trees whose cultural history had been fully recorded. Of these triploids, those of exceptional anti-scorbutic potency are Bramley's Seedling, Belle de Boskoop and Gennet Moyle, while Reinette de Canada, Blenheim Orange, Warner's King and Ribston Pippin show a potency equal to that of Lane's Prince Albert, an outstandingly active diploid. Gravenstein, though a triploid, is the least active apple registered in the investigation. Although these results suggest some connection between chromosome number and antiscorbutic activity of the apple, it is considered that conclusive evidence could only be obtained by comparing the vitamin C content of triploid forms with that of the diploid forms from which they arose, a task presenting almost insuperable difficulties. It is suggested that any further work on the subject should, however, be with other fruits or vegetables in which polyploidy occurs or can be induced and in which strictly comparable diploid and polyploid forms can be obtained.

264. HUSZ, B. 634.85.11 : 632.1

Az alma májfoltossága. (Apple-scald.)

Kísérletiügyi Közlemények, Budapest, 1932, 35 : 237-40.

A report on the occurrence of this trouble in a cold storage plant at Budapest on the varieties Batul (Batullenapfel), Török Bálint (Roter Stettiner) Szercsika, Fehér tafota (Weisser Taffetapfel). Red varieties like Jonathan stored at the same time were not affected. The conditions found favourable for scald are recorded in detail. B.H.

The following also are noted :—

- ANON. **Asparagus canning.** An authoritative account of American practice. *Food Manufacture*, 1933, 8 : 113-6, bibl. 1.
 OHO, F. **Canning asparagus in Germany.** *Food Manufacture*, 1933, 8 : 117-21, bibl. 4.

PROCESSING.

265. SERENI, D. 668.526.4(45)

The Italian citrus oil industry.

Hadar, 1933, 6 : 7-8.

A method of expressing citrus oil by hand is known as the sponge method. The fruit is first cut by hand longitudinally, and, if the rind is to be used later for confectionery, laterally also by women and children at the amazing speed of 850-900 fruits each in a quarter of an hour. A second batch of workers scallop the fruit with a specially sharp knife. The extracted pulp is converted into citrate of lime. The rinds are soaked in water for about 12 hours to clear and harden them and preserve the acidity of the juice. After soaking the rinds are pressed one by one by men each using a small hand press surmounting a bowl of 5 litre capacity. The expressed oil flows into the bowl and is later freed from impurities by distillation. The pressing is done in darkened rooms from which air is excluded. The proportion of oil extracted is 50-60%. It is of a bright straw colour and of the highest quality. Storage is in hermetically sealed copper vessels. Mechanical expression is done by scraping machines. A stream of water directed on to the surface of the rind carries away the exuding oil. Oils thus obtained are inferior to those produced by the sponge method. Their colour is red or green, the aroma is faint and in course of time becomes disagreeable, the keeping quality is poor and the oil is chemically unstable. The price is from 10-15% lower than that of the sponge extracted oil. A committee under Professor Parrozzani was appointed by the Italian Government to suggest ways of improving the mechanical process. They reported that the water-washing process was faulty since impurities afterwards difficult to separate from the oil were washed out of the peel, and further, the water turns sour and hinders chemical action. They recommended instead of water the use of a solution which would preserve the acidity. They advised the use of electrolysis in conjunction with a centrifugal machine whereby the oil is brought into contact with the water for 15-30 seconds only instead of for 6-12 hours.

266. TRAUB, H. P., AND OTHERS. 634.3 : 663.815 : 581.1
Physiological anatomy, type, variety and maturity of citrus fruits as affecting quality of prepared juices.
Plant Physiology, 1933, 8 : 35-80, bibl. 46.

The authors give an account of preliminary experiments and results on the localization in the complex tissues of various citrus fruits grown in Florida, of the causal agents responsible for changes observed in the prepared juice, and the effect of the citrus type, variety and maturity factors on the physiological anatomy of the fruit used. Among the conclusions reached are the following. The cause of the bitter taste is of glucosidal origin and is localized primarily in the inner peel, veins and locular wall tissues. The mechanism involved in the development of a bitter taste was found to be non-enzymatic. The causal agent for the colour changes observed in prepared citrus juices was traced to the outer peel and identified as citrus oil. The stability of the suspension [the solid phase consisting of small particles of juice sac, locular wall, inner peel or other tissue in suspension in the liquid phase.—ED.] is being investigated on the basis of the constituents brought into the juice mixture by the method of manufacture.

267. BECKLEY, V. A., AND McCLELLAND, T. L. 668.52
Stillts for the production of essential oils.
Kenya Dept. Agr. bull. 25 of 1932, pp. 9.

The authors suggest that this bulletin should be read in conjunction with bulletin 19 of 1931 on essential oils [*H.A.*, 1932, 2 : 1 : 94.—ED.]. Specifications are given of stillts produced by two British firms. In case the cost of these should operate against their installation, the authors have worked out designs for stillts which can be constructed locally, and will produce a good quality oil. Working plans of these are issued with the bulletin.

268. GEORGI, C. D. V. 665.1.03 : 634.6
A comparison of the press and centrifugal methods for the treatment of oil palm fruit.

Malayan Agr. J., 1933, 31 : 103-18.

Comparison was made between a centrifugal extraction plant supplied by Manlove Alliott of Nottingham, consisting of elevator, digester, centrifugal extractor and conveyor and the "Stork" press installation comprising stirring kettle, hydraulic press and pump supplied by Gebr. Stork & Co., Amsterdam. The results indicate that under the present factory conditions at the Government Experimental Plantation, Serdang, where both plants are installed, their efficiencies are of the same order, approximately 88% of the oil present in the pericarp being recovered. It is shown that, although the centrifugal system yields pericarp residue with a slightly higher oil content compared to that from the press, its losses in purification of the crude oil are correspondingly lower. In the course of the article both processes are examined in detail, and a table of comparison of the two systems is given. Possible improvements in present methods are discussed. Previous articles on the same subject will be found, *ibidem*, 1931, 19 : 384-9 and 1932, 20 : 446-59.

NOTES ON BOOKS AND REPORTS.

269. HALL, SIR A. D., AND CRANE, M. B. 634.11
The Apple.

Martin Hopkinson, London, 1933, pp. 235, bibl. 60, price 10s. 6d.

This is no scientific textbook packed with indigestible facts, their meaning obscured by contradictory footnotes but a lucid treatise, full of knowledge pertinent, comprehensive and suggestive on man's most delectable fruit. The authors, as may be expected, deal very fully with genetical questions, but even in this fearsome land of chromosomes and genes and triploids, and heterozygotes and chimaeras and allo-polyploids, the practical man may walk undismayed, and will, we think, be grateful for a simple, clear exposition of breeding and allied problems. The book should appeal particularly to the practical man, its avowed aim being to put him in touch with recent developments in the practice and science of apple growing. The scientist has laid bare the inmost secrets of the apple. Can the fruit grower benefit from this knowledge? The authors not only give an account of recent genetical work on the apple but also expound clearly their own practical interpretation of the facts disclosed. In the past it has seemed that such work was only of indirect value to the grower, but now a new vista is opened, and he who would plant against the future cannot afford to disregard the findings of the geneticist. Will he plant a triploid such as Bramley's Seedling? Then genetic evidence suggests that the fertility of his orchard will be increased by interplanting with a diploid. And again, if he wants this diploid to yield up to maximum capacity, exact fertility trials point to the expediency of planting a second diploid for cross-pollination purposes. Discoveries in other fields of research are by no means neglected, chapters being devoted to:—soils, manuring and cultivation—the grass orchard—stocks and propagation—layout—pruning—diseases and spraying—varieties. The

authors do not deal with the intricate detail of particular practices, but give instead adequate and extremely useful references to reliable sources of information. The book ends with a short but valuable glossary, mainly of genetical terms used in the earlier chapters.

270. WALLACE, T. 634.1/7-1.8

Problems of fruit tree nutrition : possible lines of approach.

Imp. Bur. Fruit Production, tech. comm. 4, 1933, pp. 18 and 18. 2s.

This publication contains reprints of two articles by Dr. Wallace, namely "The nutrition of woody plants with special reference to cultivated fruit plants", *Forestry*, Vol. VI, No. 1, and "Manuring of fruit plantations and orchards", *J. Roy. Agr. Soc.*, Vol. 92. In the former are set out the general principles along which the author worked, while the latter shows how these investigations are making it possible to give general advice to fruit growers.

271. NATIVIDADE, J. V. 634.1/2-1.522

A improdutividade em pomologia. (Unfruitfulness in pomology.)

1932, Alcobaca, Portugal, pp. 231, bibl. of 21 pp., figs. 98.

This is the first contribution of the author to the study of unfruitfulness and sterility in fruit trees. The early pages contain a review of the literature dealing with the phenomenon of unfruitfulness from whatever cause. The author then presents a study illustrated by numerous microphotographs of the evolution of the flower bud in two varieties of apple, namely Bismarck and a local variety, Casa Nova de Alcobaca. The remainder of the work is devoted to an investigation of the cytological aspects of unfruitfulness and sterility in a number of Portuguese varieties of apples, pears and plums, again illustrated with microphotographs and drawings. Included in the book are a very full bibliography and tables of the flowering seasons of the leading varieties of orchard fruits under Portuguese conditions. The book is well produced, the type being large and clear and the microphotographs of exceptional merit.

272. INTERNATIONAL INSTITUTE OF AGRICULTURE. 551.566.1 : 63 : 016

Bibliography of Tropical Agriculture, 1931.

Int. Inst. Agr., Rome, 1932, pp. 70, price 10 liras.

This bibliography forms a useful reference to the more important technical publications on tropical agriculture issued during 1931. A note indicating the scope of the article accompanies each title.

[NOTE :—Full abstracts of most of the publications concerned with perennial tropical crops referred to in this bibliography will be found in *Horticultural Abstracts* of 1931.—ED.]

273. EAST MALLING. 634.1/7(072)(058)

Annual Report for 1932, 20th year (A.16).

East Malling Research Station, 1933, pp. 163, price 3s. 6d.

This report is divided into four main sections, namely :—I. *The Experimental Farm* (pp. 11-22). This section deals with the farm operations and routine observed. It includes points of interest arising in connection with the examination of crop yields and price records which is being carried out with a view to further linking up the experimental with the practical and economical side of fruit growing. Such matters as fruit yields, prices, analysis of crops under the various quality grades, results of grading, experiments, etc., are touched upon. II. *General Review of Research Work* (pp. 23-50). Here notes are given by the responsible workers on the actual progress of investigations in the different spheres of activity. The pomology staff reports on :—rootstock investigations on top fruits ; vegetative propagation of plum and apple rootstocks ; root investigations of apple trees ; biennial bearing ; double-working apples and pears ; non-setting of pear blossom ; pruning ; thinning ; manuring of apples ; variety trials ; breeding for rootstocks resistant to woolly aphis ; Kent fruit soil survey ; walnut propagation, varieties and storage trials ; classification of loganberries ; establishment of clonal races of raspberries and strawberries ; general cultivation problems of small fruits ; breeding small fruits ; thinning

of gooseberries. A note is given on progress in plot layout methods and in recording. The chief work in the physiology section has been that on vegetative propagation by cuttings and layers, on leaf relation in fruit trees including carbohydrate relations and on growth in apple stocks. Biochemical studies have been concentrated on ash analysis and investigation of the functions of the elementary constituents of fruit trees. The plant pathologists give notes on the following: crown gall; brown rot; bacterial canker of plum; raspberry mosaic; loganberry cane spot; blackberry diseases; strawberry "yellow edge"; russetting of fruit; fungicide trials on scab and mildew; various walnut diseases; a grey mould on apple roots; lilac bacteriosis. Entomology has been investigating the fruit tree red spider; apple sawfly; various mites; apple blossom weevil; apple fruit tortrix; raspberry beetle; other *Rubus* pests; capsids; derris as an insecticide; and the testing of rootstocks raised at the John Innes Institution and at Malling for resistance to woolly aphis. Notes are given on work with hops on cultural trials, manurial experiments, new seedlings and downy mildew. Section III (pp. 51-140) is devoted to preliminary research reports on the following subjects:—harvesting of apples and pears; apple varieties; irrigation of apples; cultivated blackberries, dewberries and hybrid berries; walnuts in England; weather in 1932; plant diseases in 1932; raspberry cane spot; spraying for scab on apple and pear; pests in 1932; the strawberry tarsonemid mite; apple capsid control. Section IV (pp. 141-159) contains five articles on subjects of special interest to the grower. They deal with the revival of small fruit growing; the advisability of picking apples with their stalks; control of raspberry mosaic; walnut growing in England; symptoms of manurial deficiencies in hops.

274. NEW ZEALAND.

634.1/7(931)(058)

Report of the Department of Scientific and Industrial Research, for 1932.

Wellington, N.Z., 1932, pp. 58, price 1s. 6d.

Fruit Research, pp. 26, 27. *Research Orchard*. Individual trees have been recorded for two years, and on the information thus obtained a series of manurial trials have been laid down. *Insect Pests*. The life histories in New Zealand of codlin moth, leaf roller caterpillar and red mite are being worked out. Only one brood of codlin moth occurs each year. There appear to be two distinct types of red mite eggs, one proving highly resistant to spray treatment. *Fungous pests*. Accurate identification of fungi causing wastage in cold storage has been found particularly necessary before tests for control could be undertaken. *Spray Materials*. The efficiency of a sulphur spray has been shown to depend entirely upon the fineness of the sulphur grains, and therefore colloidal sulphur proved the most effective. The virtue of lime-sulphur was shown to be determinable by its polysulphide content and not by its relative density. Attention to polysulphide content will in future enable russetting to be avoided and the spray to be really effective. *Rootstock investigations*. It seems likely that some 9 types of Northern Spy in use as rootstocks may be isolated. Trials are in progress to ascertain their influence on the scion. A number of East Malling stocks are also under trial. *Fruit cold storage research*. Previous findings were confirmed that a complete manurial treatment greatly assists in reducing wastage. Response to nitrogenous manures has been shown to depend to some extent on varieties. In collaboration with the Cambridge Low Temperature Research Association the following investigations on fruit sent overseas were carried out:—the effect on wastage of soil types, maturity, handling, wrapping and packing.

